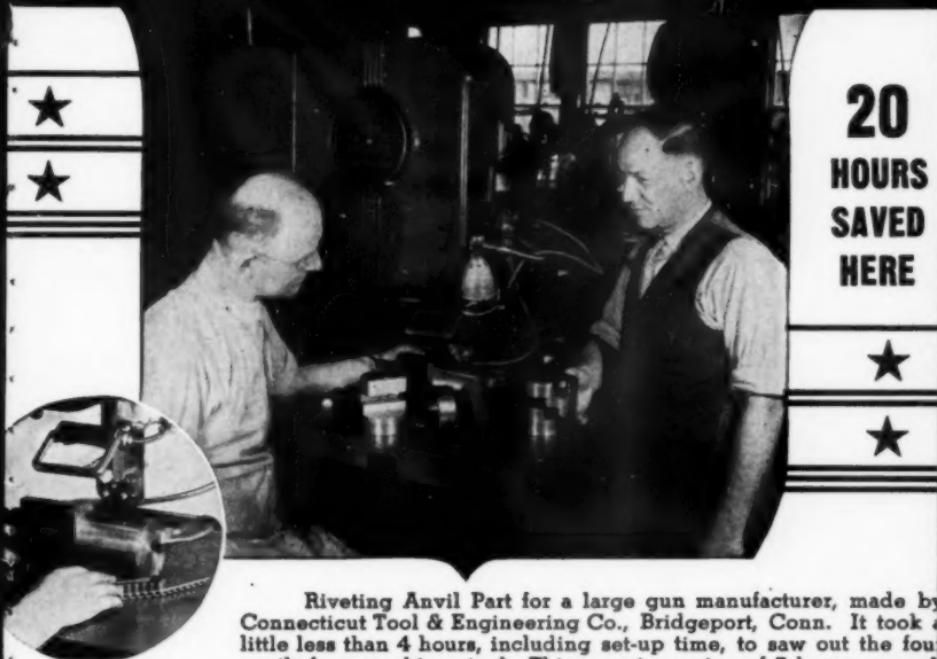


HITCHCOCK'S Machine Tool BLUE BOOK

FOUNDED

NOVEMBER 1940

1905



20
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Riveting Anvil Part for a large gun manufacturer, made by Connecticut Tool & Engineering Co., Bridgeport, Conn. It took little less than 4 hours, including set-up time, to saw out the four anvils from machine steel. This meant a saving of 5 hours on each piece as compared with milling.

FASTEST METAL CUTTING MACHINE

The DoAll offers industry the fastest method of cutting internal and external shapes from any metal up to 10" thick. Replaces shaping, milling and lathe work, and effects unprecedented savings of time, labor and material.

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You can cut-off faster
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For high speed, quantity production of pieces or lengths cut from bar stock, MARVEL Saws are unequalled. These heavy-duty all-ball-bearing sawing machines, with automatic bar push-up require no more attention than an automatic screw machine, yet produce more pieces per hour, floor-to-floor than any other cutting-off method.

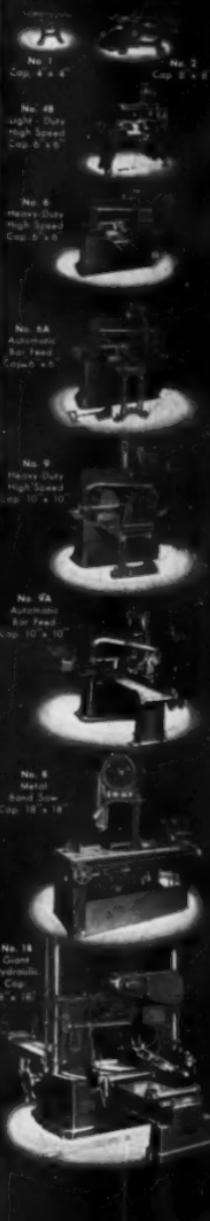
They set new standards for fast-cutting-off with accuracy and low cost per piece, on thin slices (as gear blanks) or long lengths (as rifle barrels).

These high speed "automatic" saws come in two sizes: MARVEL No. 6A, Capacity 6"x6", and MARVEL No. 9A, Capacity 10"x10". With the other MARVEL Saws, they comprise the most complete line built—a line that provides exactly suited saws for every purpose.



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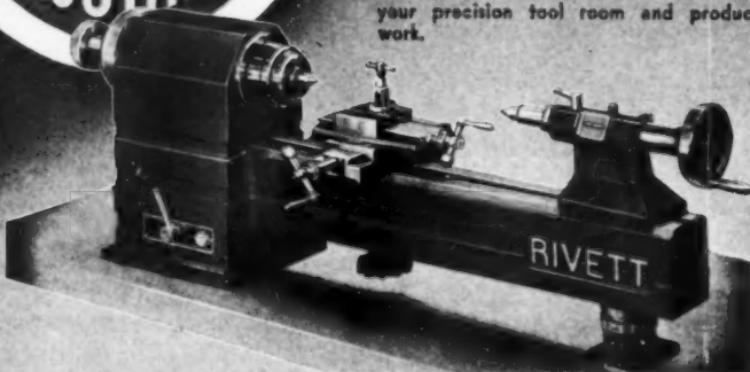
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918 BENCH LATHE

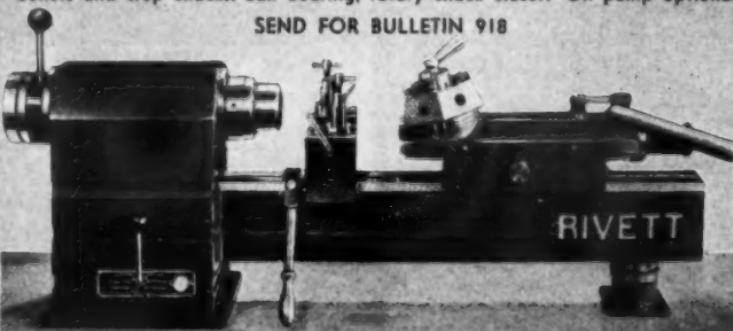
Bulletin 918 presents Rivett high precision, heavy duty bench lathe and hand screw machine. The balanced design, vibrationless performance, high spindle speeds and operating features place these machines in front for your precision tool room and production work.



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As with the bench lathe the hand screw machine has all-electric V-belt drive, speeds to 3750 r.p.m., 9" swing ball bearing spindle with long taper key-drive nose and draw-in or push-out type 1" capacity collets. For first operation bar work with or without automatic stock feed. For second operations, spring-temper collets and step chucks. Ball bearing, rotary chuck closer. Oil pump optional.

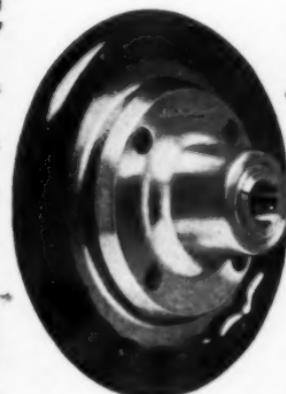
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"Saves Time and Increases Accuracy"



In use on Milling Machine

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The amazingly fast action of the Sjogren Speed Collet Chuck gives it full right to its name! An almost effortless turn of the handwheel, one way or the other, automatically opens or closes the collet, releasing or gripping the work as desired. Its grip is adjustable and sure. Most operators simply lay a hand on the wheel and run the lathe forward to tighten the collet . . . reverse to loosen.

METHOD OF MOUNTING: An intermediate plate is used to adapt the Sjogren Speed Chuck for machines with threaded nose spindles. It is mounted in the same manner as an ordinary 3 or 4 jaw chuck. Also, it is furnished complete, ready for use with machines having standard tapered key-drive or cam lock spindles.

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Products of 50 years of specialization in the development and manufacture of cutting tools, ARMSTRONG TOOL HOLDERS have the efficiency, possible only where cost can be ignored in the development and perfection of each tool design, the accuracy of die forming; the strength of special steels, drop forged, and scientifically heat treated; and, the price made possible by quantity production.

The Armstrong System provides tool holders for every operation on lathes, planers, slotters and shapers—permits higher speeds, lower costs and wider profits on every operation.

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TOOLS from your
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HITCHCOCK'S MACHINE TOOL BLUE BOOK

OVER 30,000 THIS ISSUE

NOVEMBER 1940

VOLUME 35, No. 11

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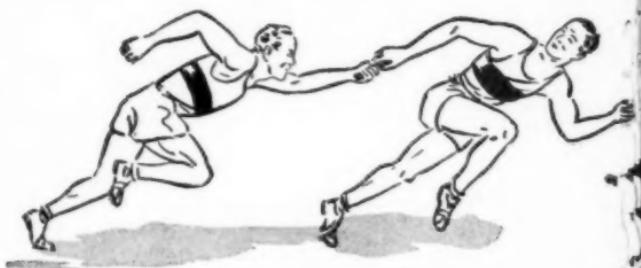
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Just a mere touch releases the tool holding collet, and permits tool changes while the spindle is revolving. Spindles are on the go all the time; tools are changed without slowing down the machine—adding many valuable minutes to productive time.

Bulletin M-10 gives you more information about the MODERN MAGIC (the original) quick change chuck and collet equipment. Send for your copy now.

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Division of Consolidated Machine Tool Corporation
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Hanna Cylinders

**PNEUMATIC**

up to 100 lbs. operating pressure

*They'll work
for you a
thousand ways!*

**HYDRAULIC**up to 1500 lbs.
operating pressure

WHEREVER you need controlled power to push or to pull, raise and lower, through rods, levers or toggles—your best bet is a cylinder—a *Hanna Cylinder*! They'll do that work with dependable efficiency at a cost that is really low. Maintenance?—you can practically forget it.

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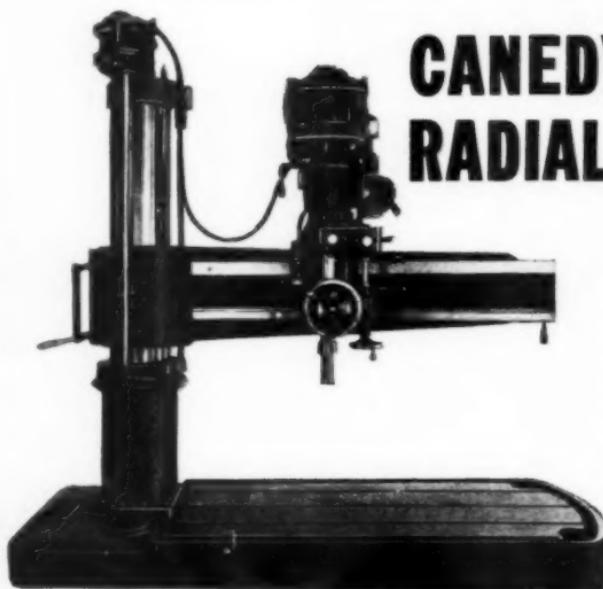
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Drills to the center of circular on base or table			
Length of arm	120"	96"	
Greatest distance from spindle to base	5'	4'	
Minimum distance from spindle to base	46"	48"	
Minimum distance from spindle to column	15"	15"	
Traverse of spindle	10"	10"	
Hole in spindle—Morse Taper	9-1/2"	9-1/2"	
Diameter of spindle at nose	No. 4	No. 4	
Traverse of head on arm	2-1/2"	2-1/2"	
Traverse of arm on column	51-1/2"	36-1/2"	
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM	(60, 85, 130, 180, (425, 560, 860, (1200 RPM	(60, 85, 130, 180, (425, 560, 860, (1200 RPM
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1260, (1750 RPM	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM	(85, 130, 180, 274, (560, 860, 1160, (1750 RPM
Feeds per revolution of spindle	(.004" .007" .010" .020"	(.004" .007" .010" .020"	
Bearing of arm on column	18"	18"	18"
Size of main driving motor	2 HP	2 HP	2 HP
Height of drill column over gears	98"	98"	98"
Working Surface of base	36 x 72"	28 1/2" x 51 1/2"	
Net weight	7000 lbs.	6200 lbs.	

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FURNISHED WITH STEEL FRAMES AND HANNIFIN HIGH-EFFICIENCY AIR CYLINDERS

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giving complete specifications
of all types.

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units for all
machine tools

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GREATEST "BUY" IN DRILL HISTORY!

SKILSAW ½ in. SPECIAL DUTY DRILL

100% ANTI-FRICTION BEARING
CONSTRUCTION FOR ONLY . . .

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LOOK at these features and you will decide to **BUY!**
Compact, modern die-cast body, helical-cut gears for smooth
performance. 2-pole safety switch. Every moving shaft
mounted on a friction-free ball or needle-roller bearing.
Powerful Universal motor for fast drilling.

The new SKILSAW Model 80 DRILL belongs in your plant
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Ask for a demonstration.

SKILSAW, INC., 5035 Elston Ave., Chicago



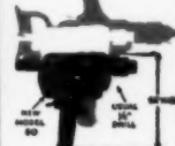
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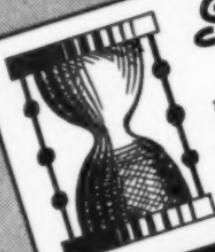




SAVE ALL
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R AND L

Save Time



The R & L Turning Tool is capable of doing many different jobs at a single setting of doing hours of setting-up work. And the saving operation features save in operation time by doing two or three jobs simultaneously . . . drilling, turning and burnishing in one operation, for example.

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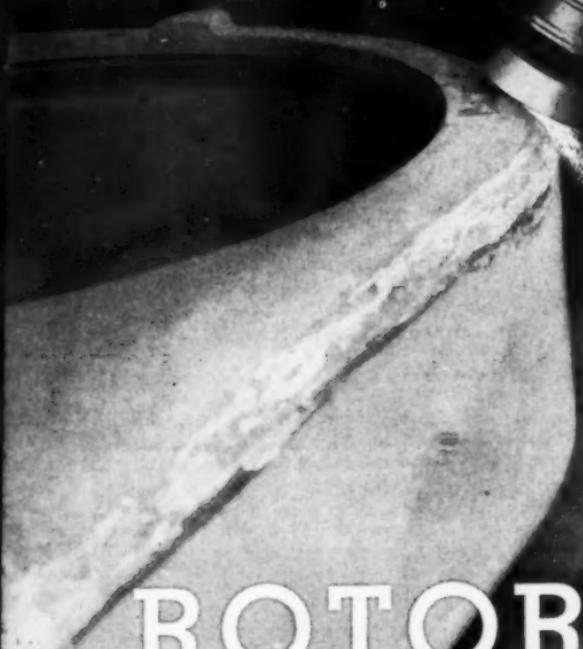
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POWERPLUS
Vertical Grinder*



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COMPANY

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THE FIRST LOW COST
PRECISION BENCH
MILLING
MACHINE**

\$195⁰⁰
AS SHOWN
Less Motor and Arbor
With
Change-O-Matic Power Feed
Simply turning a knob gives
choice of four table feeds

CONDENSED SPECIFICATIONS

TABLE	
Working Surface	4½" x 18"
Longitudinal Travel	12"
Hand	12"
With "Change-O-Matic"	10"
Feed Range ("Change-O-Matic")	162" to 9.125" per minute
Cross Travel	3½"
Vertical Travel	6"

SPINDLE AND ARBOR

Timken Tapered Roller Bearings
12 Speeds 54 to 3225 RPM
Spindle Taper, No. 2 Morse
Hole through Spindle
17/32"

Arbor Diameter 5/8"

Overarm Diameter 1 1/2"

Overall Dimensions

25 1/2" x 32 1/2" x 22" high

Base 20 1/2" x 18 1/2"

Motor Recommended

1/3 HP 1740 RPM

Weight less motor, with

"Change-O-Matic"

Feed 200 lbs.

ON paper for years—in tooling for the past two years—we've now completed development of this new Atlas Milling Machine to help meet the urgent machine tool needs of the nation.

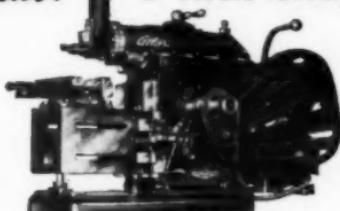
It's a remarkable miller—ruggedly built, accurate, efficient—just the machine to cut costs on all types of small milling jobs in tool room or shop.

Three types of table controls are available: standard screw feed, rapid-production lever feed, and the new Atlas "Change-O-Matic" for instant selection of automatic table feeds, priced respectively at \$175, \$180 \$195, less motor and arbor.

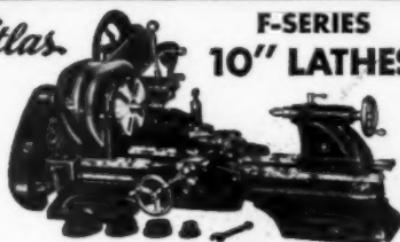
Timken tapered roller bearings carry spindle loads with a minimum of friction. An unusually wide range of spindle speeds provide correct surface speeds for all types of work and cutters. Swivel vise, rotary table, indexing centers, and safety belt guards are available.

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*Atlas.***7-Inch Shaper**

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10" LATHES**

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Price \$220

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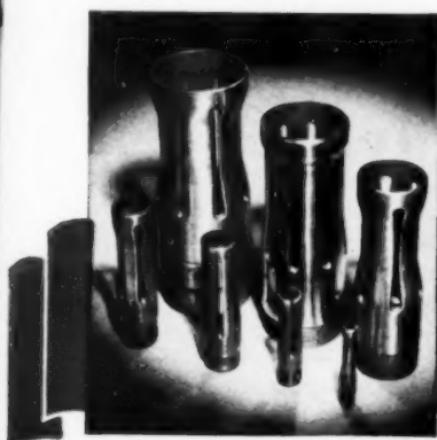


Each Model
A STAR PERFORMER

In the fast changing production systems of today, when plant facilities often become inadequate almost as rapidly as products themselves change, Duro Electric Drills, with their flexibility of uses, adapt themselves marvelously to a world of requirements. Designed for continuous operation, with a built-in stamina for extra load carrying capacity, gives you a drill unsurpassed for day-in and day-out service. Made in three styles—seven sizes. Equipped with New Departure Ball Bearings and Jacobs Chucks. Powered with General Electric Motors.

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**NON-SCRATCHING
FEED FINGERS**

• • • but it required the development of a special bronze alloy to produce a practical feed finger which would eliminate scratching on highly finished surfaces.

Modern Collet, over the past few years, designed and experimented with many types of "non-scratch" feed fingers. No other company has devoted more time to research and engineering of such a product. While several pushers were produced which did function satisfactorily, none of them matched the efficiency of Modern Pushers—known throughout the world as the "squirrel cage", "fly trap", and by other familiar names.

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403 Salliotte Street - - - Ecorse, Michigan



Non - Chattering . . . Bypass Piston Type Oil Relief Valves

An important use of these modern valves is in connection with oil hydraulic pumping units, where a specific pressure is required to be maintained, especially on machine tool hydraulic mechanism, oil burning equipment, rams, presses, etc.

The cylindrical piston closes off the port in a shearing manner and does not seat abruptly against body of valve, thereby overcoming any pounding or chattering noise, ordinarily encountered with standard valves using disc seats.

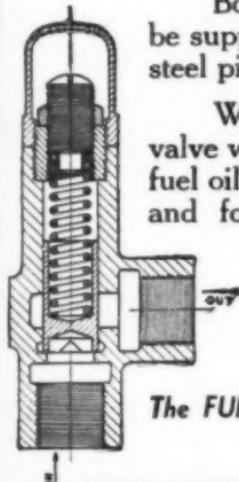
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FULFLO Valves require no attention after being installed and set for the required pressure.

*The FULFLO Line also includes Centrifugal Coolant Pumps.
May we send you bulletins?*



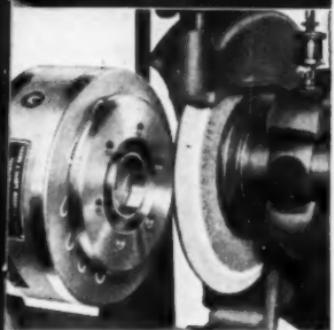
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EFFICIENT HOLDING OF WORK for many different operations with BROWN & SHARPE MAGNETIC CHUCKS

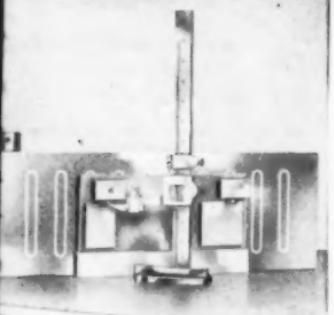
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Grinding

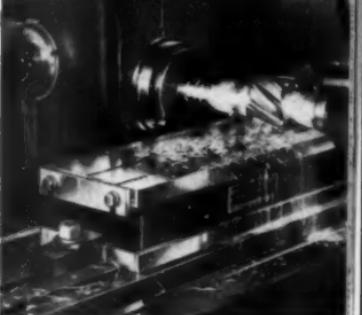
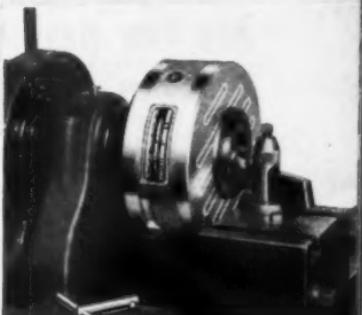


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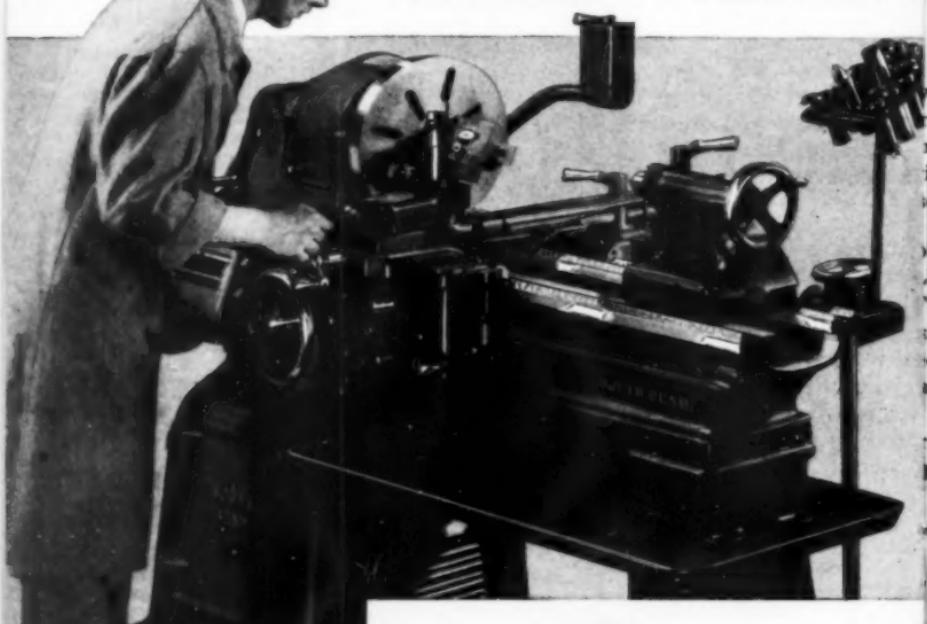
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SOUTH BEND LATHE WORKS



The Editor's Page

BEFORE some of our readers scan this page, another national election will have passed.

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Much oratory has flashed over the airways. Some of the exchanges have been heated. Mud and vegetables—verbal and actual have been tossed. We've had action every minute.

There is small comfort for the dictator nations from all of this great spectacle. After the smoke has cleared—when the people have made known their choice—then we'll all remember that we are Americans. We'll bury all our prejudices and animosities and get back to work wholeheartedly together for national unity.

The Defense Program must suffer no loss of momentum. Industry generally has been meeting every demand of the nation—and the machine tool builders will continue to place every resource at the disposal of the government in this concerted drive to safeguard the Americas.

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Lubricating the Modern Machine Tool

By A. F. Brewer, M. E.

METAL working has been an art since the days of Tubal Cain. Progressively it has dealt with harder and harder materials from relatively pure gold and silver to copper, iron, and alloy steels. As the machine age was developed, the metallurgist became more and more of a factor. He was called upon to study the perfection of harder steels which would be more resistant to wear, with adequate tensile strength to withstand shock loads of great severity. For such steels must be machined to extreme accuracy, and capable of grinding and polishing to a mirror finish.

The machinery for working these materials required equal consideration for, as precision in production was perfected, precision in machine assembly and the working of the component parts also became necessary. All this, the machine tool designer has accomplished with the aid of the steel chemist and metallurgist who have given him the raw materials with which to work.

The modern machine tool, however, required another industry to insure that in service its maintenance would not be too costly. Petroleum had to furnish the basic lubricants. Furthermore, methods of lubrication had to be devised which would assure positive delivery of grease or circulation of oil, according to the function and requirements of the parts involved.

Such machinery includes a variety of ball and roller bearings, trains of carefully cut gears which are housed and

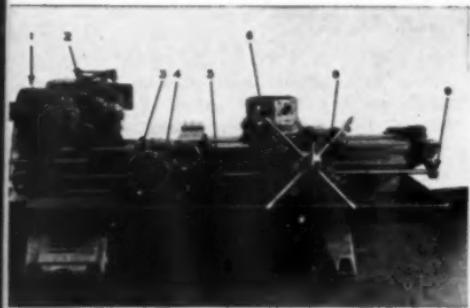
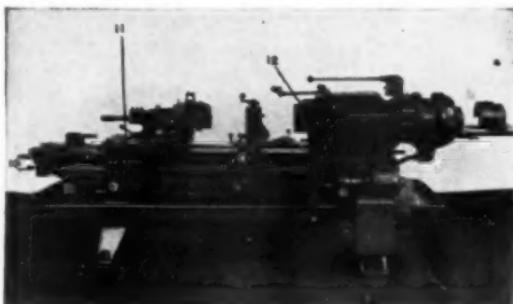
flood lubricated, and sliding surfaces such as V's which must be continuously in perfect alignment. So lubrication becomes a most important adjunct to machine tool operation and maintenance.

The machine tool industry has turned extensively to automatic lubrication as an adjunct to precision cutting and finishing of metals. This has required perfection of fully-enclosed mechanisms in oil-tight housings. It followed naturally that the industry should also adopt the ball and roller bearing. All these refinements led to the use of quality lubricants, for waste became virtually negligible; also the precise nature of the mechanisms required more positive protection. This could only be assured by highly refined lubricating oils and greases. These are most resistant to breakdown and oxidation under the catalysing conditions which so often prevail, viz., heat and agitation in the presence of copper or copper alloys.

In other respects, the selection of machine tool lubricants depends upon the method of application and the duty involved. In general, there are certain definite requirements which oil must possess, i. e.:

1. Sufficient body or viscosity to prevent metal-to-metal contact of the surfaces to which it is applied, but not so heavy as to produce high internal friction.
2. An ability to flow readily when low service temperatures are involved.

Fig. 1—Showing the points for lubrication on the Jones & Lamson saddle type universal turret lathe. Note the oil reservoir at lower right, with force feed oil pump to serve the turret saddle, aprons, bedways and cross slide ways. Headstock gears run in a bath of oil.



3. Ability to stand up under continued service without any excessive tendency toward decomposition or gumming.
4. Ability to meet special service requirements, such as quick water separation, a low degree of vaporization, and the least tendency toward emulsification.
5. Freedom from impurities which might prove injurious to the system.

Lathes

Gearing is an important part of a lathe assembly, for the speed of a lathe is usually considerably lower than the speed of the driving motor. Such gearing is enclosed in the head. Quick change gear feeds operate the power feeds; back gears are installed on certain types of engine lathes; bevel pinion and gears are found in some lathe aprons to reverse the direction of feed.

Bath or splash feed lubrication predominate in modern lathe gear sets. They insure against the possibility of abnormal wear; they also render op-

eration relatively noiseless and preclude the occurrence of back-lash. Furthermore, the one lubricant can be made to serve all gears and bearings in the assembly.

Types of Lubricants

In most machines these gears are comparatively small and so carefully designed, cut, and aligned that unless excessive bearing wear takes place, lubrication can be effected by means of a relatively fluid lubricant. An oil of from 300 to 500 seconds viscosity will have sufficient body to prevent metallic contact between the gear teeth and still be light enough to penetrate effectively to all bearing clearances.

In the case of vertical or larger types of horizontal turret lathes, however, a heavier bodied oil may be advisable for certain of the larger gears. This will be true especially where the gears are

enclosed, but have their bearings so located without the gear case as to permit of independent lubrication. In such installations, a lubricant within the S.A.E. 90 or 140 range may be advisable, depending on the closeness of mesh and whether back-lash is prone to occur.

Yet, while a heavier lubricant will eliminate a certain amount of the noise of operation and the pounding and hammering due to backlash, especially when speeds are changed, the use of too viscous a product might readily involve serious power losses on account of the added friction developed by the gears moving through the more or less inert bath of lubricant.

All machine gears, however, are not so enclosed as to permit of bath lubrication, viz., the back gears of certain types of engine lathes. Such gears must be lubricated by direct application of the lubricant to the teeth.

In service of this nature, the lubricant must not only be sufficiently viscous to preclude the occurrence of metallic contact between the teeth, but also it must be so adhesive as to stick tenaciously to these latter and resist the action of centrifugal force. Straight

Fig. 3—Top view of the headstock gearing of a Pratt & Whitney Model "C" lathe. A flood of clean, cool, filtered oil continually pours over the gears and bearings, while the lathe is in motion, being circulated from the reservoir below by a suitable pump inside the headstock. Oil level and sight gages complete the system.

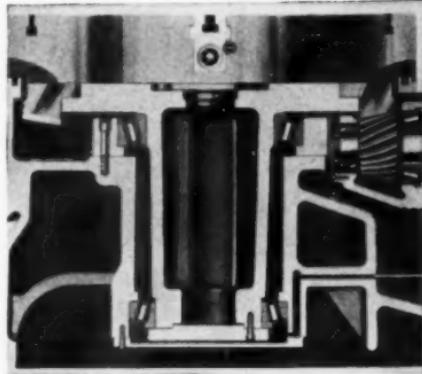


Fig. 2—A Bullard table drive and headstock mechanism on a vertical turret lathe. Lubrication is provided by pump circulation of oil from the reservoir in the base of the bed. Note application of roller bearings and the spiral bevel drive pinions running in a bath of oil delivered under pressure.

mineral gear lubricants, ranging in viscosity from 1000 to 2000 seconds Saybolt at 210 degrees Fahr., overcome this difficulty and meet both requirements.

Bearings, Guides and Slides

Lathe bearings may involve a number of types. There are the thrust bearings which take up the end thrust exerted by the spindle; they may be of the plain sleeve type, or they may involve ball bearings. Other rotating members may be carried in plain babbitt or phosphor-bronze bearings, or in ball or roller bearings. Spindle sleeve bearings should be adjustable to compensate for wear.

The higher the speeds, the more attention must be given to the bearings also to their lubrication. This is why phosphor-bronze is so extensively used as a bearing metal for the high speed journals in lathe heads.

Slides or guides include the lathe bed on which the carriage moves, and the guides on which the turret saddle and cross-slide carriage travels. Motion over a lathe sliding surface is relatively slow, but the pressures involved are high. Therefore, wear easily may become excessive, with the probability of increased power consumption, if such surfaces are not properly constructed and lubricated.

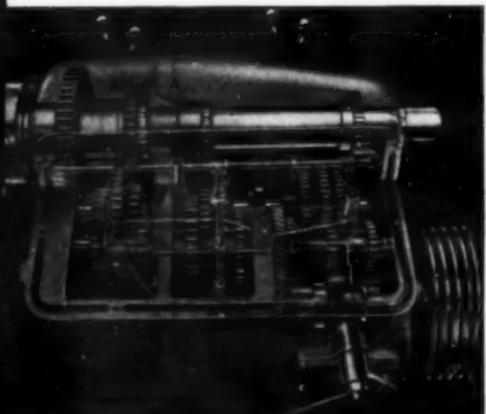




Fig. 4—The Sundstrand automatic stub lathe is provided for automatic pressure lubrication to the close fitting hardened steel ways, and other bearings. Note three views of the sight gauges on the circulating system.

Wherever abnormal friction occurs, the tendency will be for the lathe bed to wear hollow. For this reason, on most machines it is built of a high grade alloy casting and stiffened with box girders. Some are also flame-hardened to develop added resistance to wear. In certain types of turret lathes, the bed is cast integral with the head to give additional rigidity.

V-Lubrication

The carriage is usually held in position on the lathe bed by means of V-shaped projections which travel in corresponding grooves in the bed. V-lubrication is important due to the fact that abnormal wear will contribute to operating difficulties and the possibility of misalignment. For this reason, sliding surface lubrication must be given careful attention. It can be lubricated effectively by felt wipers in the sliding element or on the end of the carriage. These wipers also keep the bed V's clear of dirt.

Other designs provide for automatic fluid lubrication. Still others make use of revolving wheels located in the bedplate, which are so installed as to come in contact with the moving element as it slides over them. These wheels are usually located in a depression which can be partially filled with oil. As they revolve, they carry a film of oil to the moving slide.

Cam Lubrication

While cams are not extensively installed on most types of lathes, it being found feasible to eliminate them in the design of the moving parts, certain ma-

chines require them for the operation of the reciprocating turret slides, and the work-holding and feeding chucks.

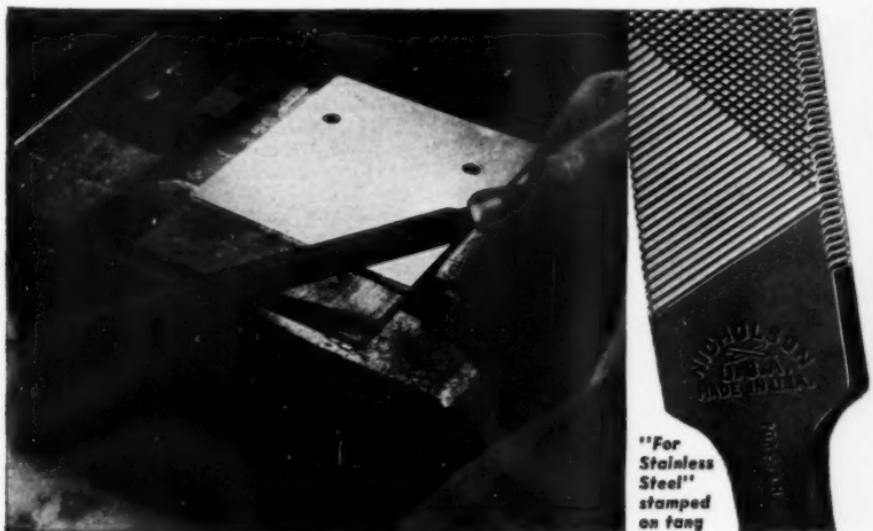
Cams may involve much the same principles as do guides, or they may be based on a combination of rolling and sliding motion. Irrespective of their design, it is absolutely essential to prevent abnormal wear, otherwise lost motion and inequalities of operation will occur to promote imperfections and inaccuracies in cutting. Cam lubrication is, therefore, a matter of moment and quite as important as the lubrication of guides and bearings.

The Planer

Spur, helical or worm gears predominate in the table drive on the modern planer. In construction, this drive consists of a rack which extends over the length of the entire underside of the table. The "bull" gear or main gear of the driving train meshes with this rack. Intermediate gears are provided to bring about the necessary speed reductions from the driving element. In the worm drive planer a worm takes the place of the "bull" gear; the table rack, however, remains the same.

Quite a difference exists between the cutting and return speeds. As a rule, the latter will be from two to four times the former, depending upon the size of the machine, and extent of cutting which may be necessary.

Gear lubrication is regarded by many as the salient factor in efficient planer operation. The occurrence of rolling and sliding friction between the respective teeth as they pass into and out



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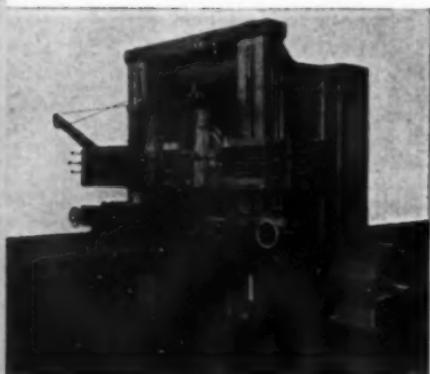


Fig. 5—The Gray planer and details of their patented system of lubrication developed for beds and tables.

of mesh is well known. Theoretically, this would take place whether the gears were run dry or not. Actually, however, the continued occurrence of solid friction would tend to supplant rolling friction with sliding friction. Wear would then tend to increase proportionally.

The substitution of fluid friction for solid friction which is brought about by the use of a suitable lubricant which will permit of the formation and maintenance of the proper film over the gear teeth, enables rolling contact to predominate as originally planned, unless faulty operation occurs, such as the gears working out of alignment.

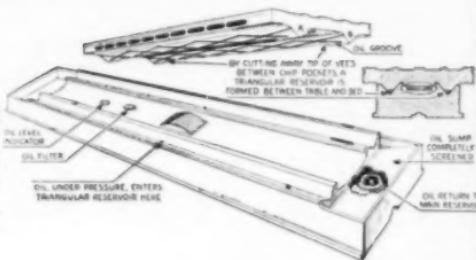
Wherever gear lubrication must be carried out independently of the V's and bearings in the planer, the type of gears and their mode of operation must be taken into consideration, just as has been explained for the lathe. Therefore, lubricants as specified or used for these latter will be equally satisfactory if applied to the planer gears. The tendency is more and more to enclose all such gearing in an oil-tight housing. Not only does this reduce the hazards of operation, but it enables more effective gear lubrication, and oftentimes eliminates the necessity of using the heavier lubricants so essential to exposed gears.

Guides and Bearings

The essential sliding or bearing mechanisms involved in the average planer include the table V's or guiding grooves such as are described for the lathe, which serve to keep the table in proper alignment with respect to the cutting tool; and such other guides as are necessary to hold the various reciprocating parts in position.

V-lubrication is naturally of chief importance, for the accuracy and degree of perfection of the work performed will depend upon the accuracy and extent to which these guides maintain alignment.

Planer V's are subject to consider-



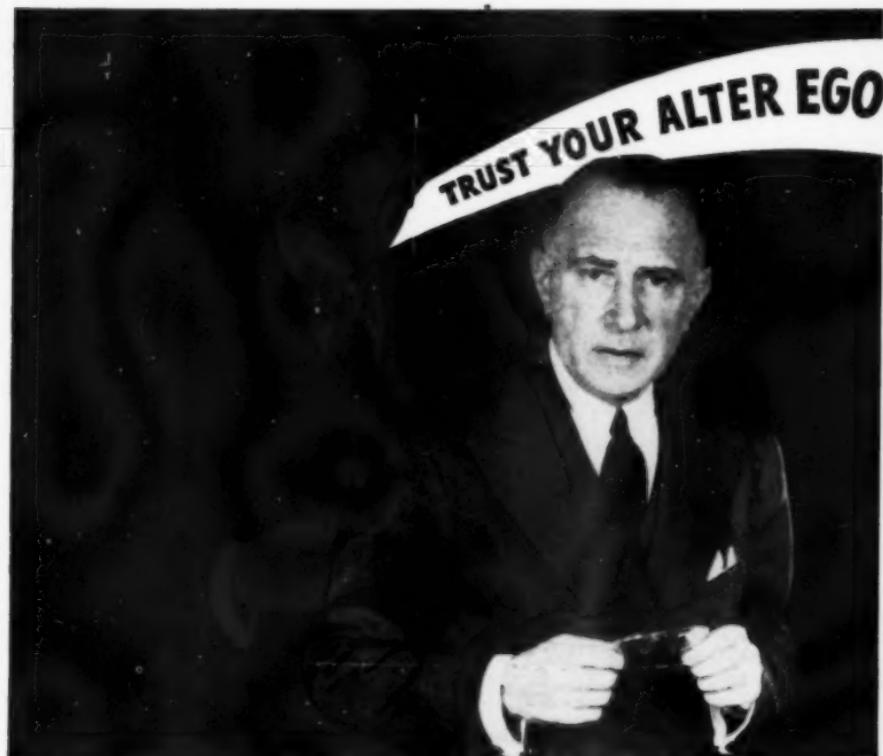
ably higher pressures and more wear than the corresponding parts on a lathe. For this reason, they are generally lubricated by force feed or by means of automatic oil rollers of some form.

Where force feed lubrication is employed, it is usually customary to have it serve not only the V's, but also the guides, bearings, and gears of the rail and other mechanisms. In such a system either a force feed lubricator or an oiling device, including a suitable independent pump and reservoir, may be used.

Milling Machines

In the development of the modern milling machine, there has also been a decided trend towards automatic lubrication of gears and bearings.

A milling cutter performs its work at a single pass, and removes metal at a relatively rapid rate. Therefore, it is absolutely necessary that the work table, spindle, and all supports and operating mechanisms be so designed and constructed as to involve no tendency



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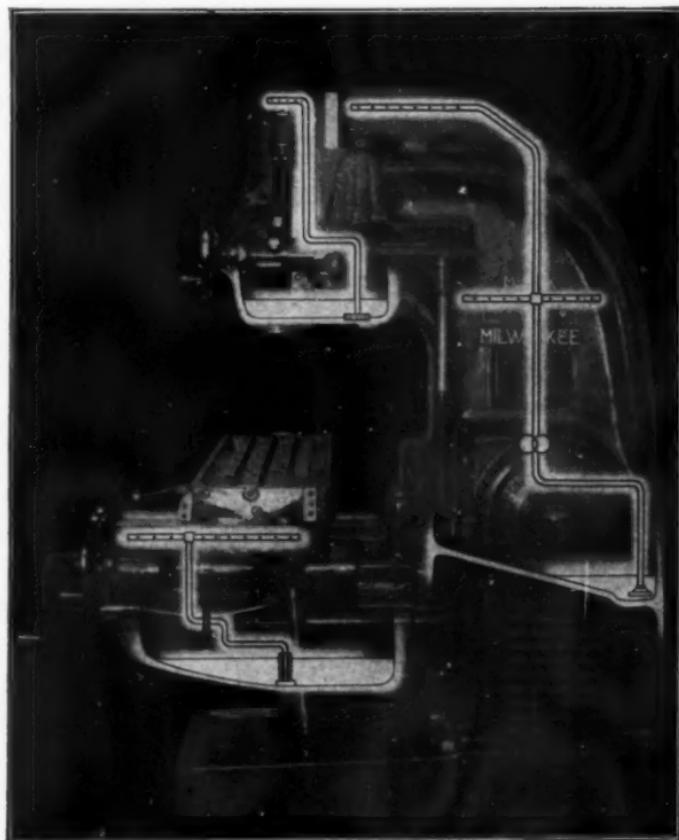
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Fig. 6 — The Kearney & Trecker "Milwaukee" milling machine, showing details of the automatic force feed oiling system. Pressure pumps are located in the column, knee and sliding head to furnish full automatic lubrication.



for the work to spring away from the cutter, or vice versa, when it is subjected to the stress of cutting.

It would not suffice, however, to rely upon rigidity and strength alone to take up these cutting strains. Wear on all frictional elements would probably only be increased in proportion. Therefore, positive lubrication must be developed. This requires a continuous feed of oil directed to all wearing parts under sufficient pressure to preserve a suitable fluid film between them and prevent metal-to-metal friction.

The extent to which such a lubricating system would have to be planned

would, of course, depend to a large degree upon the working pressures which might be developed. To meet such conditions, some milling machine builders have found that the installation of suitable oil reservoirs or independent force feed lubricators not only simplifies their problem, but affords the necessary amount of lubrication, even though the bearings, etc., are not flooded with oil. In contrast there are other builders who regard flood lubrication as so essential that they have designed their machines with absolutely self-contained oiling systems, the lubricant being pumped to the wearing parts by means of a suitable pump adjacent to or located in the oil reservoir itself.



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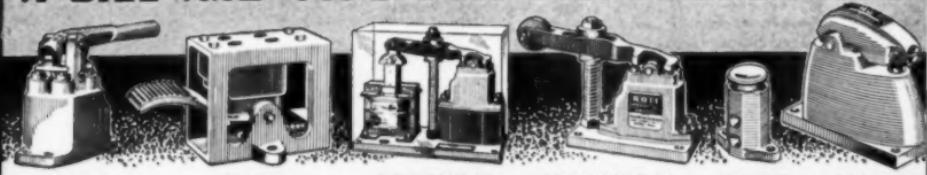
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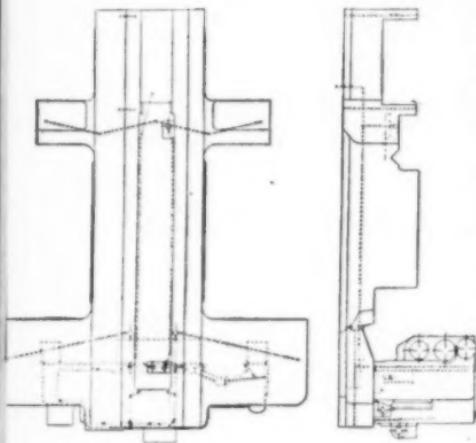


Fig. 7—Oiling diagram showing distribution lines to the apron and carriage on a Le Blond heavy duty lathe.

Thus, throughout operation, a flood of oil is continually passing over all gears and bearings. In such a system, the one grade of oil, i.e., a medium-bodied straight mineral machine oil of from 300 to 500 seconds Saybolt viscosity (at 100 degrees Fahr.), will usually give satisfactory lubrication of the various moving parts.

Somewhat heavier oils may be required, however, in bath lubricated systems. The latter are particularly adaptable to column mechanisms. Here, with the gears of the drive shafts running submerged in oil, a sufficient amount of this latter is splashed to all parts of the column to lubricate effectively the bearings. The lubricant does its work under relatively low pressure, volume being relied upon to maintain the requisite oil films.

Shapers and Slotters

Lubrication of the shaper or slotter differs but little from that of the planer. Essentially the same variety of operating mechanisms is involved, hence the same respective grades of lubricants can be used with equal satisfaction. Automatic lubrication, while, of course, not universal, is nevertheless generally regarded as an advantage by many leading machine builders.

In these machines, pressure lubrication by means of oil, involving some form of plunger or geared pump is applicable, just as it is to the planer and certain other types of tools. Pressure lubrication is especially advantageous on machines doing deep cutting of hard steel where the reaction pressures exerted on some of the gears and bearings may be comparatively high.

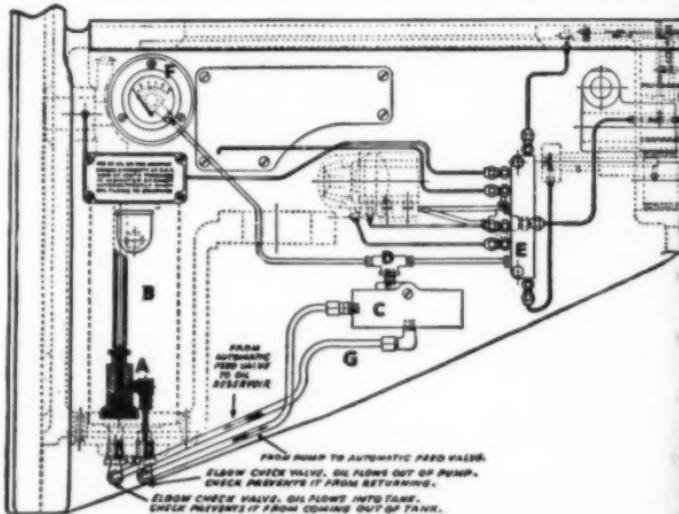


Fig. 8—Details of the automatic lubricating system in the knee of the Brown & Sharpe light type milling machine. Plunger pump "A" delivers oil from reservoir "B" to automatic feed valve "C"; thence through fitting "D" to header "E" from which oil tubes lead to all lubricating points. Gage "F" indicates the pressure. "G" is a return or bypass pipe to the reservoir which functions when the system is filled with oil and pressure builds up.

In vertical Milling Machines also, rigidity originates in the column — the backbone of the machine — and determines the productive capacity of the machine more than any one other factor.

Note how carefully the column of a Milwaukee Vertical Milling Machine has been engineered for the proper distribution of metal. An inside horizontal wall divides it into a double box section, the cross mounting of the motor permits a solid rear wall, which, together with the solid front face, assures an unusually rigid structure.

KEARNEY & TRECKER CORPORATION • Milwaukee, Wis. U. S.



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MILWAUKEE MILLING MACHINES

Where clearances are relatively high, wear might not become abnormal for the lubricating film would be thicker. But high clearances are not conducive to accurate cutting; therefore, they should be kept always within the limits of practical operation. This, however, might interfere with the maintenance of a suitable lubricating film, especially where hand oiling is relied upon. So it is in the interests of economy of upkeep and maximum production to resort to automatic lubrication as a general rule.

Drills and Boring Mills

Drills and boring mills are identified according to size. The former are used for small work. The latter for boring out machine parts, such as car wheels, engine connecting rods, etc., and differential housings or crankcases in the automotive industry. One of the most frequent functions of a boring machine is to prepare the aperture, which is to ultimately house a shaft and its accompanying bearing.

Boring Mill Service

Boring mills are built either horizontally or vertically, according to the work which is to be handled. The horizontal mill is adaptable to work which cannot be revolved readily, the tool, therefore, being the rotating element. This machine is also suited to the boring of long or deep holes and the boring of more than one hole in the same

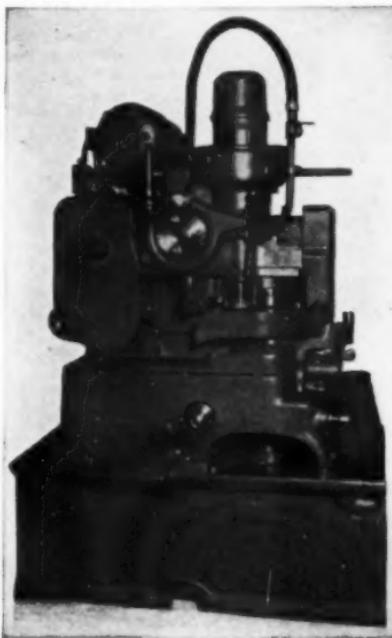


Fig. 9—(above) Front view of Felt No. 7-A high speed gear shaper.

Fig. 10—(below) The lubricating system on a Cincinnati cylindrical grinder showing how low pressure filtered oil is circulated to the table ways.

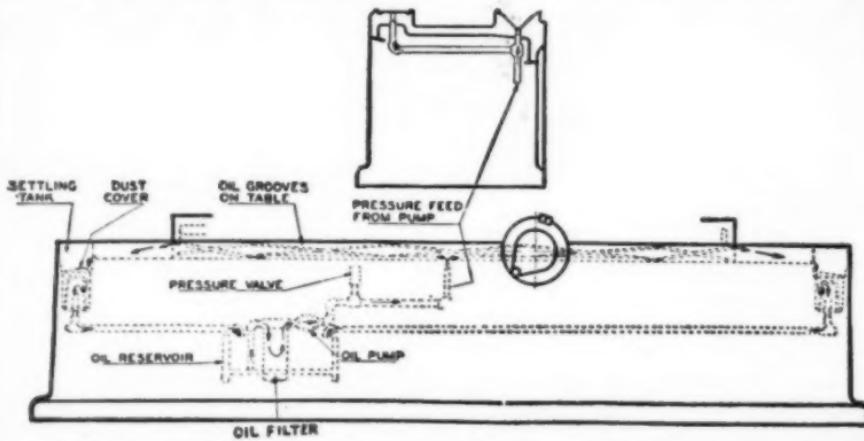


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EQUIPMENT

piece, especially where these holes are located in different planes. The horizontal boring mill is also capable of milling and drilling.

The vertical boring mill, in turn, is adapted to work which can be revolved, and where balance is a factor to reduce the effects of centrifugal force. In other words, it is used for work which can be fastened to the table and rotated thereon. As a rule, therefore, machine parts of relatively smaller caliber, such as pulleys, gears, piston heads, machine discs, and casings, etc., are finished on vertical boring mills.

Essentials of Lubrication

Boring mills involve much the same type of moving parts as the lathe or planer, etc. In other words, there are the driving gears, the feed and traverse gears, the screw by which the table and saddle are adjusted, the V-tracks on which the saddle rests, and the miscellaneous bearings and guides involved in connection with the above.

In certain types of boring mills, considerable thrust will be exerted upon

the spindle or boring bar. This is especially evident on the horizontal machine, for which reason, many such mills are built with V-tracks on either side of the spindle. These V's take up the thrusts of operation effectively, provided they are properly lubricated.

Pressure lubrication is widely used on the boring mill. Builders have realized the enormous pressures which must be carried sometimes by certain of the wearing parts of their machines. They have furthermore realized that where equipment of the size and complexity of the boring mill is involved, the most dependable results are attained if the operator is not expected to combine the duties of an oiler with his more specific duties of producing the maximum of correctly machined products.

For the general lubrication of boring mills, a medium bodied straight mineral oil has been found to be most satisfactory. Essentially it must be of the same characteristics as the oil used elsewhere in the shop. For all-round lubrication, a viscosity of from 300 to 500 seconds Saybolt at 100° F., will be suitable. Such an oil will have sufficient body not only to serve the bearings, but also the slides and enclosed gears, where it is delivered under sufficient pressure.

Where gears are not enclosed in oil tight casings or on rack, worm, or screw mechanisms, a somewhat heavier product may be advisable. Usually a viscosity of approximately 1000 seconds Saybolt at 210° F., will suffice for such service. For other gearing which operates enclosed and designed for splash lubrication, a straight mineral oil similar to automotive gear lubricant will be applicable, i.e., within the S. A. E. 90 to 140 range.

NOTE—A. F. Brewer, author of this article is Mechanical Engineer attached to the Technical and Research Division and Editor of the magazine "Lubrication" published by The Texas Company, 135 E. 42d St., New York, N. Y., through whose courtesy this material has been supplied. Part II will appear in the December issue.

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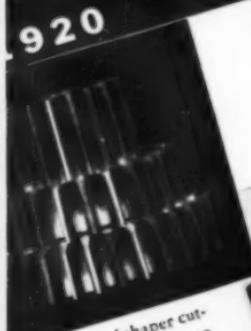
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915



Michigan Tool Co. first started. At extreme left is Carl Halborg, Colonial Brush Co. President. At extreme right is Thor Olson, V. P. of Ex-Cell-O. Next to Olson is Otto Lundell, late President of Michigan Tool. Rear right is Robert Anderson, late Treasurer of Company.

920



Production of shaper cutters is added. Business on gear cutting tools particularly develops to such an extent that larger quarters are necessary.

1921

Michigan Tool Co. erects its own plant on Jos. Campau.



1924



The plant is now too small and a second floor is added.

1927

Recognizing the inadequacies, slowness, and relative high cost of grinding gears, Michigan Tool Co. develops the crossed axis method of gear finishing.



1922



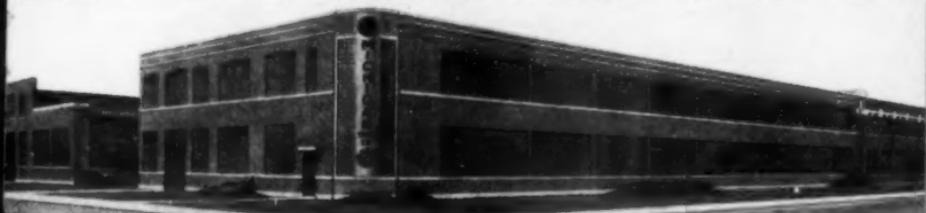
Michigan Tool Co. now enters the field of producing ground form finishing hobs. Develops line of hob and hob checking fixtures for greater accuracy.

1930



There is immediate acceptance and demand for this equipment. Michigan Tool Co. adds a line of gear checking and lapping equipment. The plant is now too small and a new plant is built on 6-Mile Road.

TWENTY-FIVE YEARS . . . BETTER GEAR ... so that in 1940



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1936

Again the plant is too small and a large wing is added in which production of machinery is concentrated.

1939

Cone-Drive production has developed rapidly with construction of equipment.



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Recent Developments In Balancing Machines

By WERNER I. SENGER
Chief Development Engineer, Gisholt Machine Co.

WITHIN the past 10 years, the average individual has come to use many devices that incorporate rotating elements which, if not properly balanced, will produce vibration and noise. Today, in the average home we will find vacuum sweepers, portable electric fans, electric refrigerators, oil burners or stokers, ventilating systems, and many other devices which produce vibration and noise if the rotating elements are not properly balanced. In addition to these domestic devices, the average individual comes in contact with automobiles, trucks, or busses and other devices incorporating rotating elements which should be balanced to reduce the nervous strain and fatigue associated with the operation or use of unbalanced rotating devices.

In this same period of time, we have also seen a very definite trend toward higher speeds. Since the forces producing vibration increase as the square of the speed, rotating elements operated at these higher speeds must be more accurately balanced in order to eliminate vibration.

From these considerations, the average user of such commonplace devices containing rotating elements has come to associate unbalance with vibration and noise and believes the terms to be practically synonymous. Technically, unbalance is a displacement of the center of gravity of a rotating body from its axis of rotation. To eliminate unbalance, we must therefore, determine

the magnitude of displacement of the center of gravity from the axis of rotation as indicated by the bearings supporting the rotating body. If the weight of a rotating body is known, in ounces, and if the displacement of the center of gravity with respect to the axis of rotation is known in inches, the product of these two values will determine the number of ounce inches of unbalance which is present in a body. An ounce inch may also be described as the unbalance effect produced by a one ounce weight displaced one inch from the axis of a rotating body. Today, balancing is being commercially done to control the displacement of the center of gravity with respect to the rotational axis to an accuracy of .00025" down to .0000-25". As a matter of fact, the requirements of one particular job known to the writer are that the center of gravity of a body weighing 11 ounces be balanced to such a point as to reduce the displacement of the center of gravity from the rotational axis to .000001", which represents an unbalance of 11 millionths of an ounce inch.

Figure 1 shows the actual pounds of centrifugal force which will be exerted by an unbalance of 1 ounce inch at different speeds. From this chart, it will be seen that a 1 ounce inch unbalance at 200 r.p.m. will produce a centrifugal force of only 1.15 ounces, but, at 5000 r.p.m., this force will be 44.3 pounds and at 10,000 r.p.m. the force will be 177 pounds. From this chart, it will be evident that a small unbalance in a vacuum sweeper run-

ning at 12,000 to 20,000 r.p.m. will produce vibrations of a high order, due

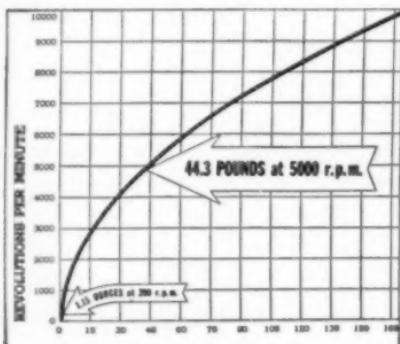


Fig. 1 — Centrifugal force—pounds, caused by one ounce inch of unbalance.

to the presence of the large centrifugal force developed at these high speeds; and this large force, in addition to producing noise and vibration, must necessarily cause considerable wear in the bearings and so tend to reduce very materially the life of the device.

There are two general types of unbalance which may be present in any rotating body due to the displacement of the center of gravity with respect to the axis of rotation. The first of these is called static unbalance, which may be determined readily by placing the bearing surfaces of the body on two parallel horizontal bars or ways as shown in Figure 2. The center of gravity of an unbalanced body placed

on such parallel bars will necessarily seek a position directly below the rotational axis of the body, except for the effect of rolling friction between the body and the supporting parallel bars.

A body which has been corrected for static unbalance may still show considerable vibration when rotated. This will be due to the presence of dynamic unbalance which will tend to cause the axis, as determined by the bearing diameters on the shaft, to generate two intersecting cones. This type of unbalance may be represented, as shown in Figure 3, by two equal weights at opposite ends of the body and spaced angularly 180 degrees apart. From this sketch, it will be obvious that the body shown may be in static balance but the two equal weights on opposite ends of the body will actually create severe vi-

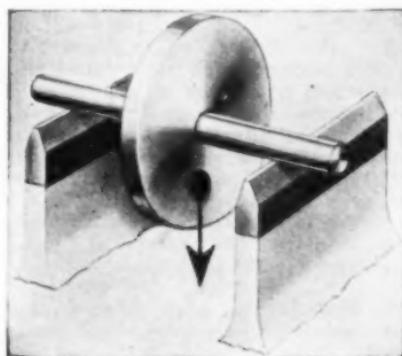


Fig. 2—Static balancing ways.



Fig. 3—Dynamic unbalance.

bration when the body is rotated. Actually, it is to be expected that both static and dynamic unbalance will be present in any rotating body and corrections for these combined unbalances are generally made by the application of only two corrections.

Referring to Figure 4, which is intended to represent any body, let us assume that the unbalance H represents one of any number of heavy points in the body which may cause



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vibration of the shaft on which the body rotates. Let us also assume that the planes "M" and "N" represent two transverse planes in which material may be most practically added or removed for the purpose of eliminating the effect of unbalance in the body. From the pure mechanics of the problem, it is obvious that if a correction "C" of 4 ounce inches and a correction of "D" of 2 ounce inches is made respectively in planes "M" and "N" the body will be in balance. Obviously, this same procedure may be used for any number of unbalances at any position in the body so that it is only necessary that we make corrections for resultant unbalances in the two planes "M" and "N."

During the past 20 years, a number of different types of balancing machines have been developed for the purpose of measuring static and dynamic or combined static and dynamic unbalance. The earlier machines were simply glorified "guessing" machines and the result produced by the combination of machine and operator was largely dependent on the skill of the operator. These machines required that, by a trial and error process, the operator add or remove unbalance from rather poorly indicated positions; and, if the operator had sufficient patience and skill, it was possible frequently to obtain very commendable results. However, industry soon found that there were few men who could become skilled operators of

such equipment, and that this skill could only be acquired over a long period of time. Even as operating skill was developed, the time for bal-

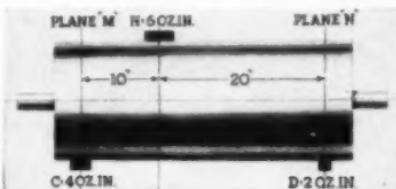


Fig. 4—Corrections for dynamic unbalance.

ancing did not decrease although in many cases the accuracy of balance obtained by the operator might improve. Today, balancing machines are made so that there is a minimum of operator skill required. These newer machines also interpret readings of unbalance into actual "practical" correction values. For example, the operator of the newer type of balancing machine reads exactly the depth to drill a given size of hole at a given point or points in the work to produce a condition of balance; or the operator may read directly the number of 64ths of an inch of length of strip steel to be added to a part at a definitely indicated position in order to produce balance in the part. With equipment of the newer sort available, only limited operator skill and experience is required and parts may be measured and corrected for unbalance in a sur-

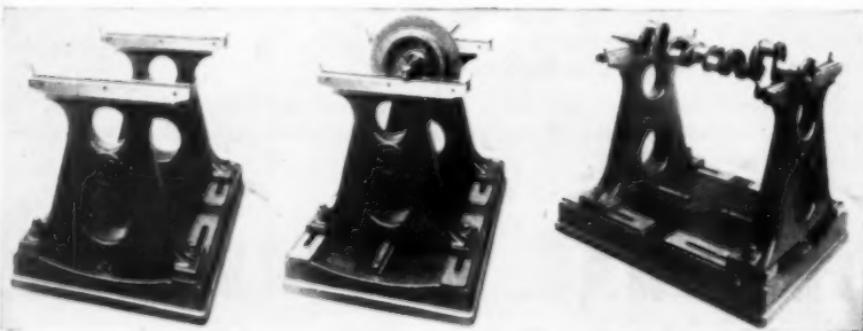


Fig. 5—Conventional ways commonly used for testing static unbalance.

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prisingly short time, to an accuracy far superior to that obtained by previous methods.



Fig. 6—Balancing machine for flywheels, etc., which converts readings of unbalance directly into depth of hole to drill at an indicated part.

Where parts were formerly checked for static unbalance on parallel bars or knife edges (or the equivalent produced by two pairs of supporting rollers) such as are shown in Figure 5, they are now balanced on a machine of a newer type where the readings of unbalance are converted directly into the depth of hole to drill at an indicated point on a machine of the type shown in Figure 6.

This type of static balancing machine is used for the measurement and correction of unbalance in narrow-faced parts, in which the possibility of the presence of dynamic unbalance is almost nil. The machine is used to measure and correct the unbalance in parts such as flywheels, clutches, road wheels, narrow fans, pulleys, and airplane propellers. Depending on the size and type of part to be balanced, 25 to 40 pieces per hour may be measured, corrected, and checked for balance to accuracies of the order of .1 to .2 of an ounce inch.

Operation of the machine is as follows (See Figure 7),

The part to be balanced is mounted with its axis in a vertical position on an adapter carried on a spindle, which in turn is carried on a cradle hung from two vertical flat springs which act as pivots. The pivots allow the work to move about a horizontal axis determined by the pivots. The heavy point of the work piece will cause the spindle and supporting cradle to move

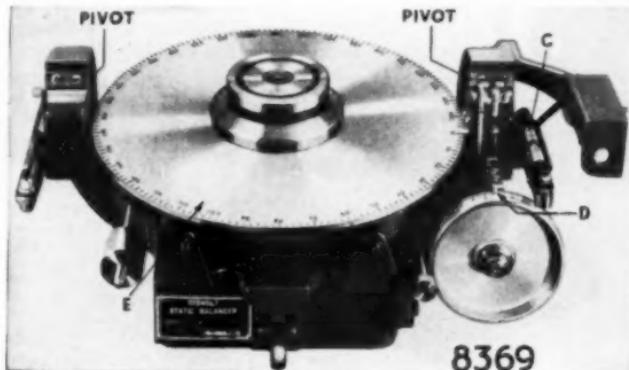
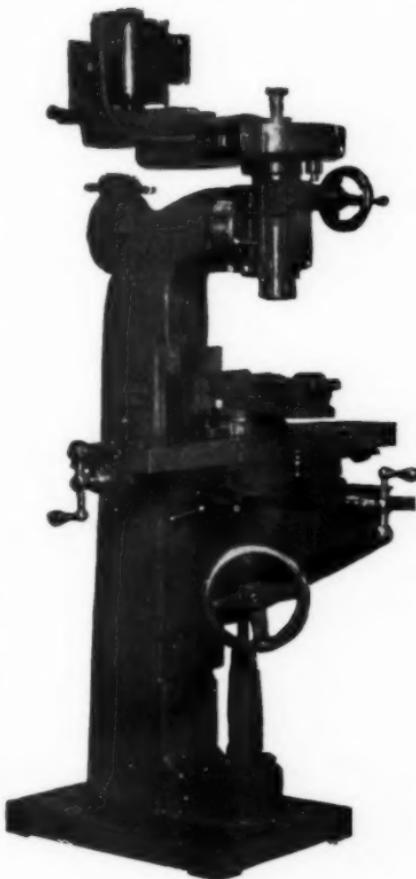


Fig. 7—Details of balancing table on machine shown in Fig. 6.

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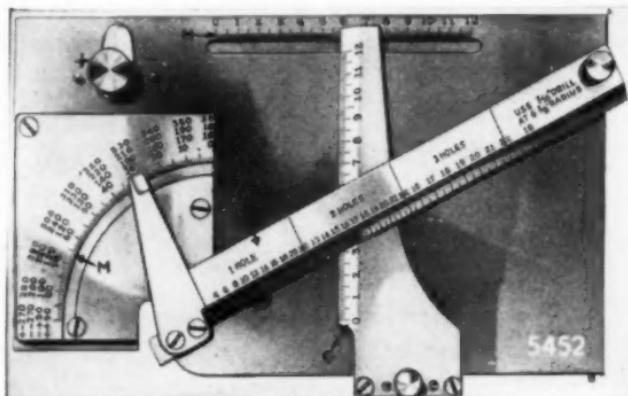
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Fig. 8 — Cutmeter which indicates the number of holes and depth of holes required for balancing corrections.



out of level an amount which is indicated by means of the sensitive level "C." This out-of-level condition is corrected by turning the dial "D" until the bubble in the level is in a central or balanced position. The reading on the dial is then noted.

The vertical scale "G" on the cutmeter (Figure 8) is then set so that this reading of the dial "D" is indicated on the horizontal scale "H." The work is then rotated 90° by manually turning the table "E." The table is graduated angularly to facilitate this operation. With the part in this position, the bubble in the level is again

brought to a central position by turning the dial "D." The protractor scale "K" of the cutmeter is then moved until the lower edge intersects on the vertical scale "G" at the value corresponding with the seconding reading of dial "D."

The table "E," together with the work, is then turned to the angular position indicated on the protractor "M" of the cutmeter. With the balancing machine table locked in this position, correction is made for the number of holes and depth of hole as indicated by the graduations on the arm "K." The accuracy of balance may then be

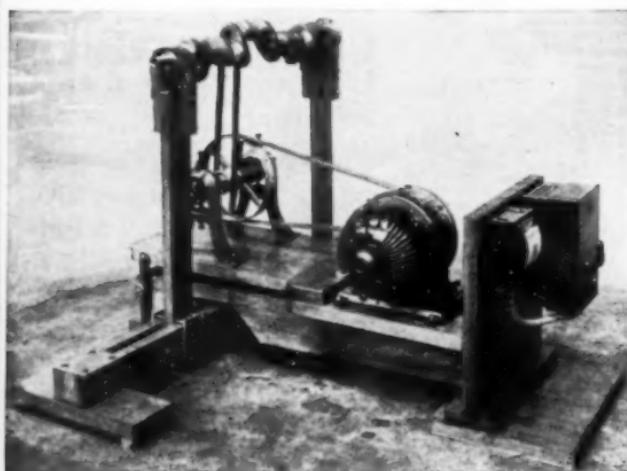
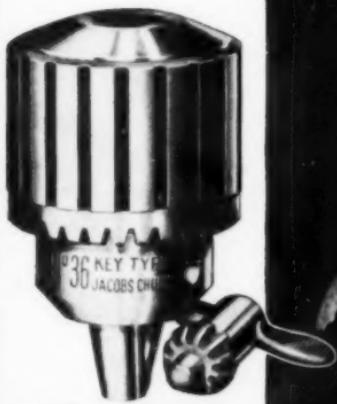


Fig. 9—An early type of dynamic balancing machine of the so-called "wiggler" type.

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checked by observing the readings on dial "D" for any two 90° positions of the work and table "E."

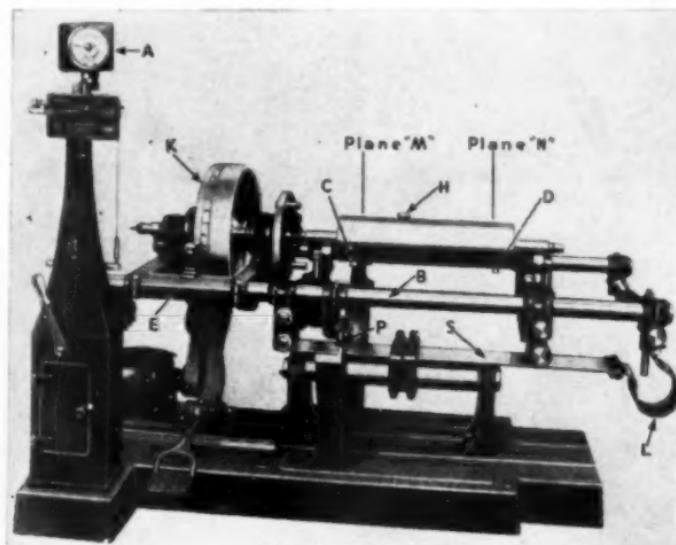
Here we see in a very simple static balancing machine, a means whereby the requirements for skill on the part of the operator have been entirely eliminated, thus permitting him to use his energy in the actual production of more parts balanced to high orders of accuracy.

Dynamic or combined static and dynamic balancing machines have shown equal development in the matter of increasing production and in reducing the requirement for operator skill. One of the earliest types of dynamic balancing machines was the so-called "wiggler" type shown in Figure 9. In this type of machine, the part to be balanced was supported on its end bearings by means of two spring members which permitted the unbalance to cause vibration in one plane of the part to be tested. Most of these devices were driven by belt directly over the work and one means or another was used to scribe lines on the bearing surfaces themselves to indicate the point of maximum displacement of the work. This point of maximum dis-

placement was a means for determining the approximate angular location of the unbalances in each end of the shaft and the shortness of the line scribed on the bearing was an indication of the magnitude of the unbalance. Obviously, this type of machine is purely and simply a "guessing" machine, and to obtain even fair results, must be handled by a skilled operator. A further disadvantage of this type of machine was that an unbalance in one end of the part would actually cause vibration of both supporting structures so that the actual indications observed were almost impossible of interpretation by even a skilled operator.

In order to eliminate the difficulties involved in this type of device, where unbalance in one end of the work piece would affect observations on both ends of the pieces, the pivoted cradle type of balancing machine was developed. In this, the work is supported on rollers or bearings which are carried on a pivoted frame having a fulcrum at the point "P" as shown in Figure 10. Now, if one of the planes of correction selected for the work piece is so placed as to include the pivot axis of the balancing machine, it is obvious that un-

Fig. 10 — The pivoted cradle type of dynamic balancing machine.



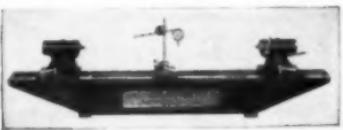
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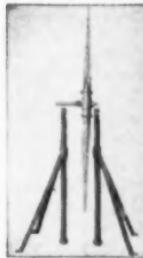
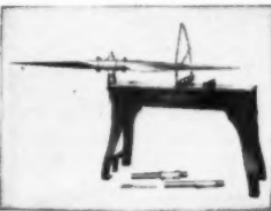
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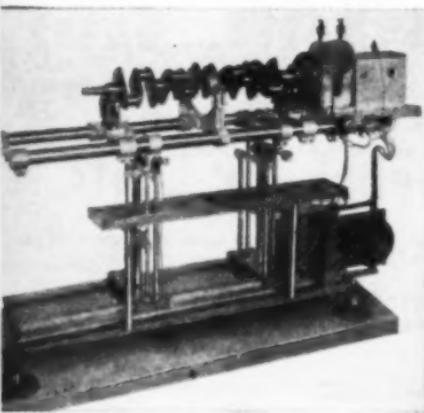


Fig. 11—Another type of pivoted frame dynamic balancing machine.

der rotation, any forces in this plane will actually be absorbed by the pivots and will in no way tend to cause oscillation of the frame of the machine.

The pivoted machine frame is supported at one end by means of a spring "S" which makes the entire structure flexibly supported to permit of oscillation about the pivot axis. Unbalances in the plane of correction removed from the pivot will necessarily cause oscillation of the supporting frame which can be recorded by means of a suitable amplitude indicator. A compensating device in the flywheel "K" will permit reducing the amplitude of vibration of the frame to zero. The setting of the compensating device, which reduces frame oscillation to zero, will be a measure of the unbalance in the correction plane of the work piece removed from the pivot.

In the pivoted frame type of machine, it is obvious that the small unbalances in the work piece must move a considerable mass in addition to the mass of the work piece. This added mass is of a "parasitic" nature and tends to reduce the accuracy of the measurements which are obtained.

In another type of pivoted frame machine (Figure 11), arrangement is made for pivoting the frame at either of the

correction planes while measurements for unbalance are observed in the plane removed from the pivot. This type of machine eliminates the necessity for turning the piece end for end in the machine as was required of the machine previously described. However, the use of a pivoted frame, which must be moved by the small unbalances present in the test piece, prevents the measurement of extremely small unbalances and the rollers used to support the work on this type of machine will mark the bearing portion of the work piece.

The pivoted frame types of machines use compensating weight arrangements as a means to measure unbalance; and these compensating weights generally read unbalance in ounce inch values which are difficult for the average operator to interpret into actual depth of hole to be drilled or actual length or weight of material to be added. Although the conversion of these ounce inch units into actual weight to add or remove may be obtained by a simple multiplication process, this requires accuracy in the performance of the multiplication. After the actual weight determinations have been made, the use of a chart or other means is required for converting weight into actual drill depth or stock length to be added for correction.

The Gisholt Type S Dynetric Balancing Machine shown in Figure 12 provides a means whereby the operator quickly and accurately may determine to a high order of accuracy, the exact amount in "practical" units of correction, to apply at indicated points to produce balance. In this type of machine, the work piece is supported, with its axis horizontal, in two half bearings "C" (Figure 13), which are of a good bearing material and in no way tend to mar or damage the bearing surfaces of the work piece. These half bearings carry the work on the same bearing surfaces as are used to support the work in its final assembly. The bearing parts are easily changed to suit a variety of work pieces. The half bearings are carried by light aluminum supporting struc-

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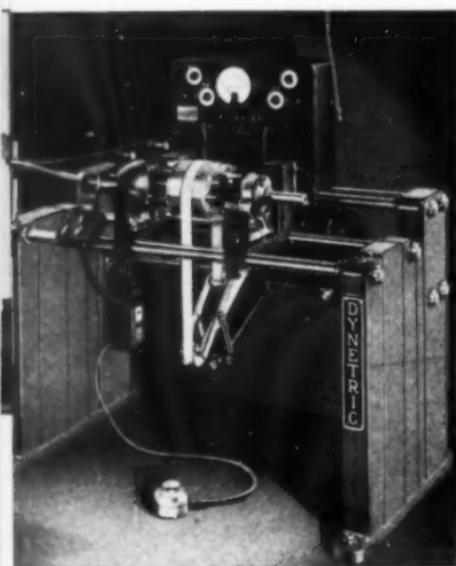


Fig. 12—Type "S" Dynetric Balancing Machine.

tures "D," suspended from wires "E," which permit vibration of the work piece only in a horizontal plane. Obviously, with the use of these light supports, the unbalance in the work piece is required to move a minimum amount of "parasitic" weight. These work supports are so designed as to have a low natural rate of vibration. This low natural rate of vibration is generally about 1/10 of the rate at which the work piece will be rotated during the balancing operation. As the structure has this low natural rate, it is obvious that vibrations from the floor can be expected to cause motion of the work piece in this structure only if their rate is equal to or less than the natural rate of the supporting structure. Therefore, this mechanical supporting structure definitely tunes out all external vibrations at the frequency corresponding to the speed at which the part is to be balanced.

The work is driven by means of a belt "A" (Figure 14) from a suitable driving motor. Even though the belt is not smooth and uniform, it will not

disturb the machine indications because of the presence of an electrical filter which will be described later. To make the work piece rotate, the operator simply depresses a foot switch which starts the driving motor. Releasing pressure on the foot switch will cut off the power to the driving motor, applying a brake on the motor causing the work piece rotation to stop quickly. The driving belt is easily and quickly removed from the work piece to permit easy and rapid loading of the work by means of a lifter arrangement operated by lever "B." The work may then be loaded easily into or unloaded from the half bearings "C."

With the work piece running in the machine, any unbalance in the work will cause vibration of the supporting structure "D." Attached to the work supports are wires "F" which mechanically transmit the vibration of the supports to coils which are in the field of the powerful permanent double ring magnets "G." Vibration of the coil in this strong magnetic field causes an alternating voltage to be generated in the coil. The alternating voltage is transmitted to the cabinet by means of wires "H" (Figure 15). The cabinet contains an amplifying unit, similar to a standard radio amplifier, by means

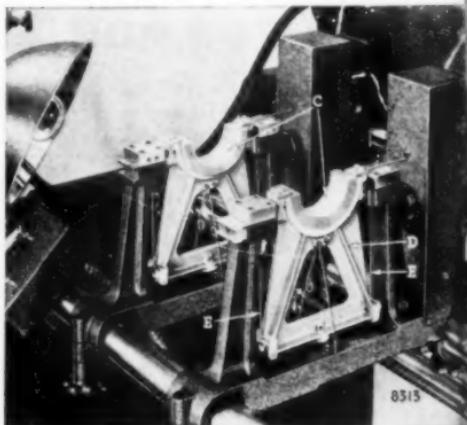


Fig. 13—Closeup of half-bearings in which piece to be tested is mounted.

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Right: Greenerd H-56-D Hydraulic Arbor Press at Pratt & Whitney Aircraft Plant. Used for pressing bearings into connecting rods for Wasp Aircraft Engines.



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Left: Greenerd No. 4 Hand Arbor Press in the Boeing Aircraft Plant, Seattle Wash. Used here for a straightening operation.

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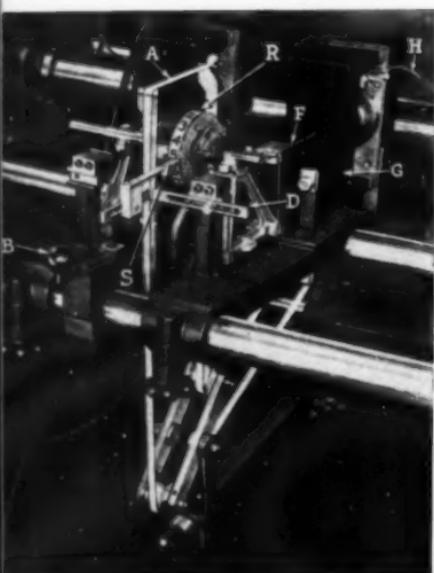


Fig. 14—Drive mechanism and supporting structure details.

of which the generated voltages are amplified as much as 1,600,000 times. The amplified voltage is taken to the sensitive meter "M" and will cause a motion of the meter needle which is proportional to the amount of vibration or the amount of unbalance in the work piece.

The cabinet contains a filtering device which can be set by means of the "Speed Adjustment," dials "J," to accept from the pick-up coils only those voltage frequencies which occur once per revolution of the work piece and attenuate all other frequencies. These dials serve a purpose similar to that served by the tuning dial on a home radio receiver which permits of receiving only a desired station and attenuates or tends to reject all other stations. Obviously, the vibrations by means of which alternating voltages are generated at the rate of one alternation per revolution of the work must be caused only by unbalance. Therefore,

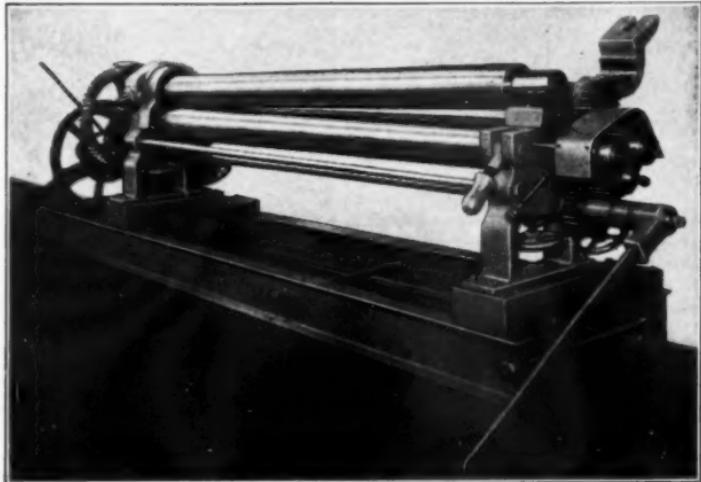
the only alternating voltage which is passed to the meter "M" is produced by unbalance effects. Neither floor vibration passed by the mechanical supporting structure nor motions due to irregularities of the driving belt will cause voltages to be generated in the coils which will be passed to the meter.

The controls used by the operator in routine production balancing consist of three levers "K," "L," and "N" (Figure 16) which are conveniently located in a control box. Control lever "K" is used to select either the "Right" hand or the "Left" hand plane of correction (as has been previously shown, all unbalances may be removed by applying corrections in two selected planes). The lever "L" determines whether the "amount" of unbalance correction is to be read on meter "M" or whether the "angle" of the unbalance correction is to be indicated by a number on the graduated band or dial "R" (Figure 14) attached to the work piece. This number will be caused to apparently "stand still" in front of the pointer "S" when viewed under the illumination from the stroboscopic lamp (Figure 17). This stroboscopic lamp flashes for about ten millionths of a second each time the voltage generated in the pick-up coil



Fig. 15—Electrical amplifying control and indicating mechanism.

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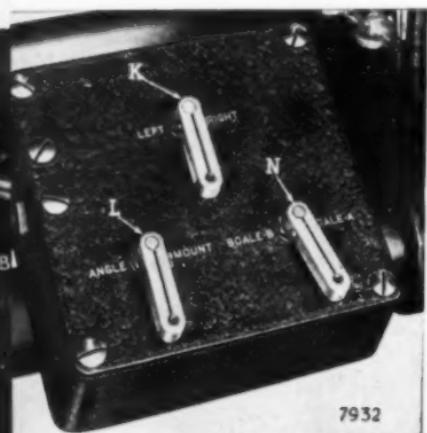


Fig. 16—Controls used in routine production balancing operations.

changes from negative to positive. The stroboscopic lamp is a thermionic (vacuum) tube and requires no mechanical contacting device to cause it to operate—it requires only a change in voltage. The numbered graduation which apparently "stands still" is in the radial plane in which the unbalance correction must be applied.

The third lever on the control box permits the operator to use either fine "Scale A" or coarse "Scale B" on the amount meter "M" for determining the amount of unbalance.

To measure and locate the unbalance in each of the two transverse planes in the work piece where correction may be applied most easily, the operator first throws the lever to "Right" and "Amount" and reads on the meter the amount of unbalance correction to be applied in the right hand correction plane. Throwing the lever to "Angle" will cause a number on the graduated scale on the work piece to "stand still" in front of the pointer "S" and thereby point out the radial plane in which the correction must be made. The operator then sets the lever to "Left" and determines readings of "Amount" and "Angle" in the left selected plane. Corrections are then applied in accordance with the machine indications. This entire measuring operation can be performed in 20 sec-

onds, with ease and precision.

The "Amount" of unbalance in the "Right" and "Left" correction planes may be read directly on the meter in "practical" units which are easily understood by the unskilled machine operator. Each unit on the meter "M" can, for example, be adjusted to read

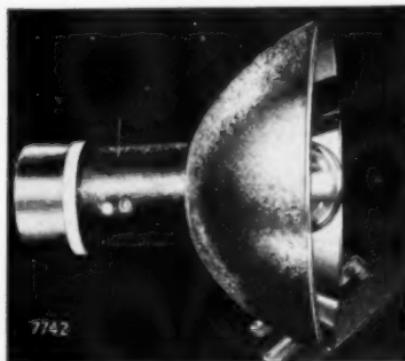
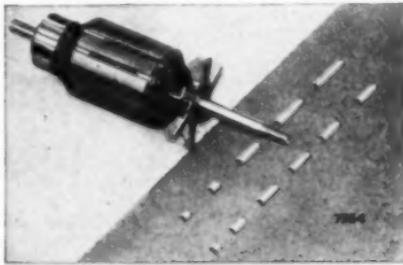


Fig. 17—Stroboscopic lamp used to reveal the radial plane in which unbalance correction must be applied.

directly in 1/64ths of an inch of depth of hole to drill with a selected size of correction drill, or in $\frac{1}{16}$ ths of an inch of length of wire solder, or 1/1000 of an ounce of weight to add to the work. For example, in balancing the small motor armature shown in Figure 18, the



meter was adjusted to read directly in 1/64ths of an inch of length of extruded aluminum form which should be pressed into the proper slots in the armature in order to reduce bearing vibration to zero.

(NOTE—Part II will appear in the December issue)

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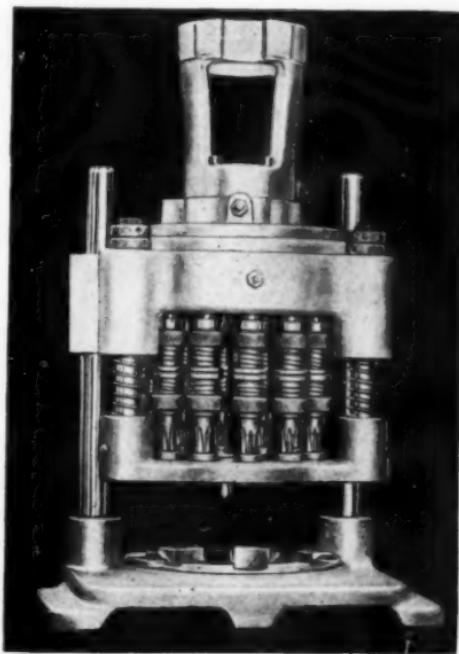
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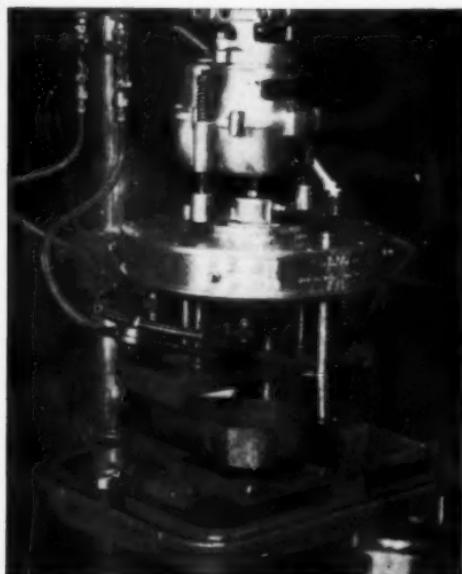
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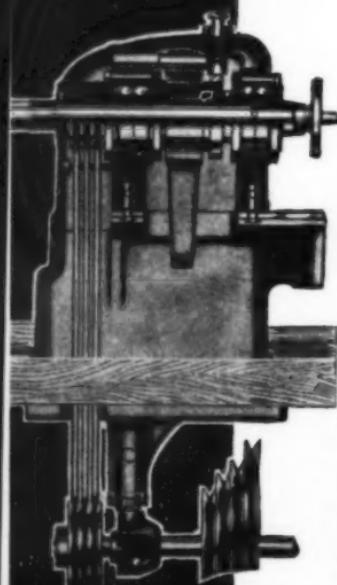
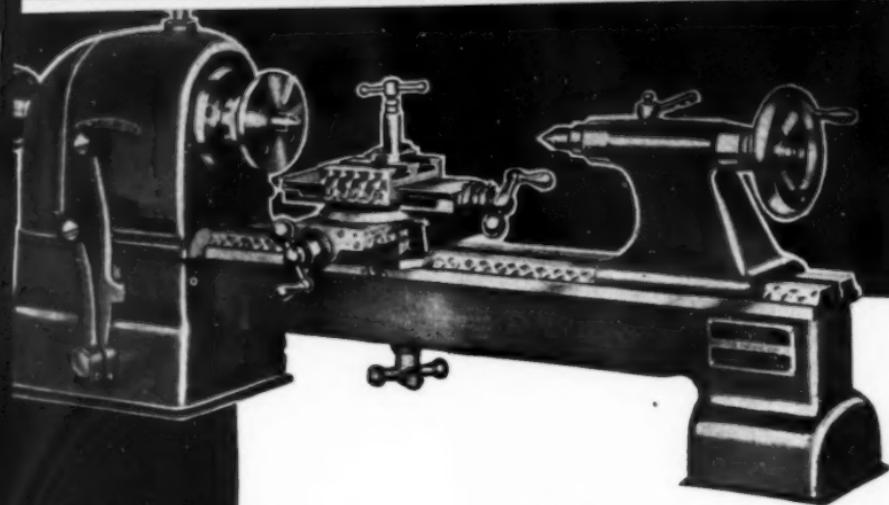
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Cutting Large Gears

A Precision Method of Indexing in the Cutting of Large Diameter Gears

By SAMUEL KOFFSKY, Chief Engineer
Simmons Machine Tool Corp., Albany, N. Y.

THE principal difficulty in cutting large diameter gears on available gear cutting machinery is in obtaining a minimum deviation in the tooth spacing. The method of indexing on such machines by the use of a worm and worm wheel gives appreciable errors on large gears due to the fact that the table worm wheel diameter is small as compared with the gear diameter and any deviations in the worm wheel tooth spacing are multiplied proportionately.

In the past, the teeth were accurately

scribed by hand, a microscope being used to assist in scribing a fine line through the center of each tooth space. This proved to be costly and subject to errors in lining up the scribed marks with the microscope cross hair. Our company has devised a method of "Disc Indexing" that has produced very accurate results in gears as large as 24 feet in diameter. The method employs ground discs in combination with a special gage block and is somewhat analogous to the use of Johansson gage blocks for measuring length.

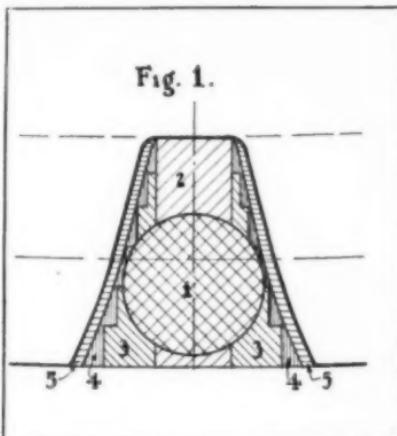


A 36 ft., Circular Boring Mill showing main drive gear, cut by the method explained.
Gear has 348 teeth, 1 1/4" D. P., 20" full depth involute, maximum spacing error .003".

After the gear blank is machined to the correct outside diameter, it is advisable to scribe the pitch diameter and root diameter on one side of the rim. The tooth spaces are then scribed by the use of a template and dividers with sufficient accuracy to rough cut the teeth to within $\frac{1}{8}$ " of the finished dimensions. This rough cutting is done most rapidly by the use of a radial drill set along side a slotter. The drill removes stock rapidly, leaving only a trimming operation for the slotter, the two working simultaneously as the gear blank is rotated from tooth to tooth. Where the gear is so large that it is not practical to move it for the feed motion, the slotter should have a movable head or an in-feed attachment on the ram tool holder. The in-feed motion need only be slightly greater than the full depth of the gear tooth. In rough machining the tooth spaces, stock can be removed to the full depth of tooth, leaving about $\frac{1}{8}$ " on the tooth flanks for the finish machining. See Fig. 1 for the cutting sequences on a typical tooth space.

The precise indexing is now performed through the use of ground discs and a gage block. The object is to make a number of identical discs whose outside diameter is such that when placed around the periphery of the gear so that they touch each other and are tangent to the outer circumference of the gear, the number of discs required to circumscribe the gear will be exactly the same as the number of teeth in the gear. It is evident that for a straight

Fig. 1.



rack or a gear of infinite diameter, the diameter of these discs would be exactly the same as the pitch of the gear teeth. For external gears, the diameter of the discs is smaller than the circular pitch and for internal gears it is larger.

The approximate diameter of these discs is easily calculated. Add .001" to the calculated diameter and make five discs $\frac{1}{2}$ " thick, ground to this diameter. A $\frac{3}{8}$ " hole is drilled through the center to facilitate clamping the discs in place. (See Fig. 2.) For ease in identifying the discs, we will number them from 1 to 5.

Disc No. 1 is clamped on the gear rim so that the disc edge is tangent to the face circumference of the gear. Disc No. 2 is placed adjacent to and

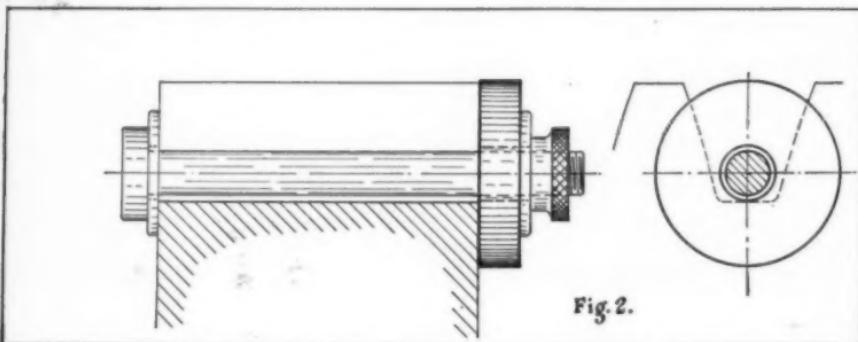
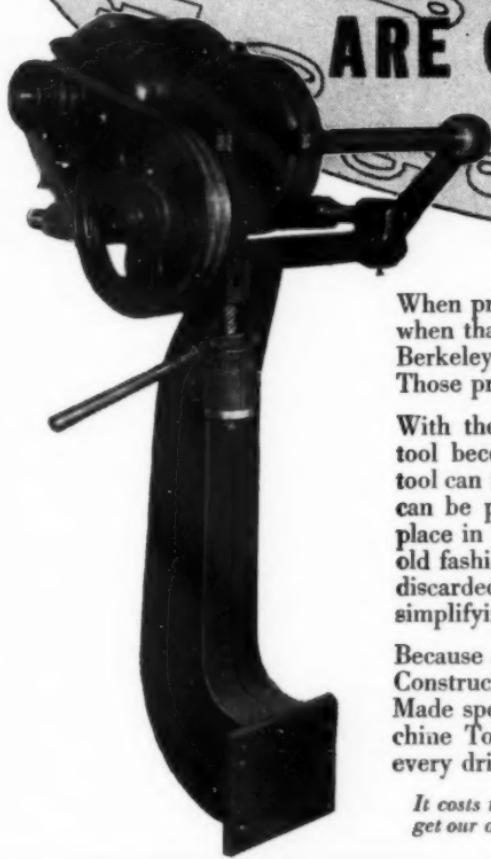


Fig. 2.

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touching disc No. 1, and is likewise clamped in position tangent to the outer circumference of the gear. Discs Nos. 3, 4 and 5 are placed in like manner, each disc touching the previous one, being at the same time tangential to the face of the gear.

Disc No. 1 is not disturbed and remains as a locating point for the start of the indexing. Disc No. 2 is carefully removed and clamped in position adjacent to disc No. 5. Disc No. 3 is removed and placed next to disc No. 2 in its new position. This procedure is continued moving the four discs Nos. 2 to 5 around the circumference of the gear until we approach disc No. 1, which was left in its original position to serve as a reference point.

Because the discs were ground .001" oversize, the last remaining space should be too small to accommodate a disc. A micrometer measurement is taken of this space and the difference between this measurement and the diameter of the discs is noted. Dividing this difference by the number of teeth in the gear gives the amount that should be removed from the diameter of the discs. In grinding the discs to the new diameter, care should be exercised to leave them a fraction of a thousandth over-size.

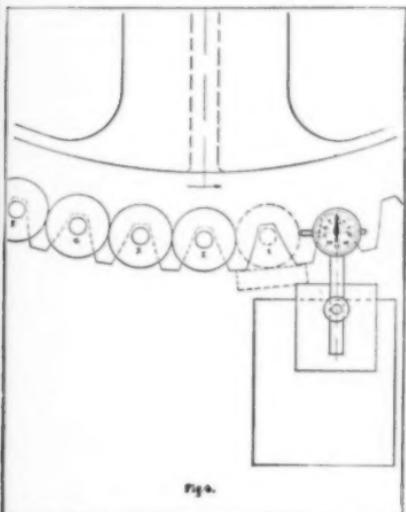


Fig. 2.

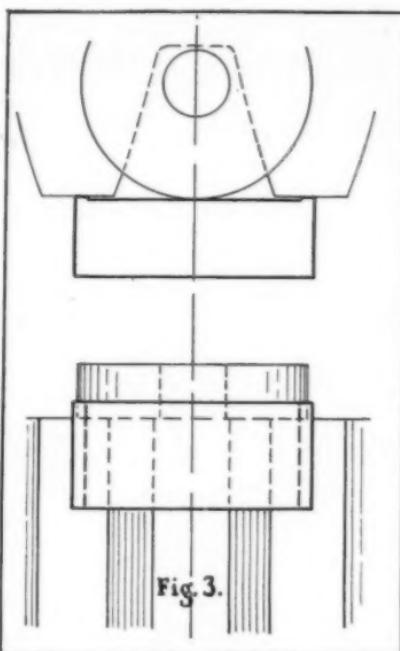


Fig. 3.

We are now ready to make a second circuit of the discs around the rim of the gear. This time a special gage block is used to position the discs against the outer circumference of the gear. This block is made as shown in Fig. 3 from 1" x 3/4" steel. Its length is a fraction more than the tooth spacing and it has two small pads $\frac{1}{8}$ " wide x $\frac{1}{64}$ " thick at the ends of the side that is placed against the gear face. In operation, the block is placed with the small pads against the gear face, the top surface of the block projecting about $\frac{1}{8}$ " above the rim. In clamping the discs, each one is placed in contact with this block and also with the adjacent disc.

As before, disc No. 1 is clamped in position and remains unmoved to serve as a point of reference. The space between the last disc applied and No. 1 is measured and should be a trifle oversize, let us say by .030". No further

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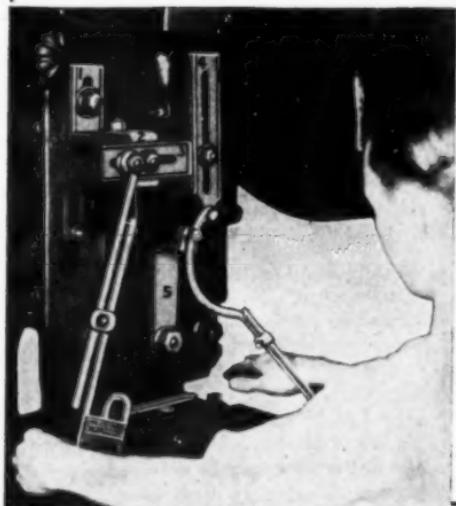
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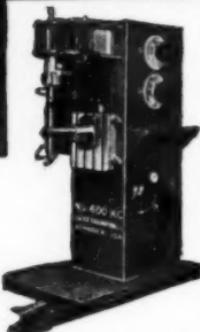
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grinding is necessary on the discs but a small amount is removed from the two pads of the gage block, thus bringing the discs nearer the center of the gear. The amount necessary to remove from the pads is approximately one-sixth the closing error, in this case .005". A third circuit of the discs should now show a closing error of practically zero.

We can now proceed with the finish cutting of the gear, using the discs and the gage block in combination, for indexing the tooth spacing. A milling cutter can be used for this operation but a heavy duty slotter with an in-feed attachment for the tool has been found most satisfactory. Accurate grinding of the tools is most important and the full profile should be removed at the finish using a fine feed.

The indexing is accomplished by setting up a dial indicator on a substantial immovable base, some distance away from the slotter, say at least 90 degrees around the circumference of the gear. The five ground discs are clamped in position, side by side, with each disc set tangent to the gage block. The indicator is brought against disc No. 1 until it reads zero, as shown in Fig. 4. The first tooth is finish cut. Disc No. 1 is removed and the gear rotated, closing up the space until the indicator reads zero against disc No. 2. While the second tooth is being cut, disc No. 1 is placed adjacent to No. 5. This procedure is continued until all the teeth have been finished.

The principal advantage of this method of indexing is that it eliminates possibility of accumulating errors. Any error in an indicator reading on one set-up is nullified at the next succeeding set-up. With a reasonable amount of care, a rigid machine for cutting and proper tooling, it becomes possible to cut large gears with tooth spacing deviating not more than one or two thousandths of an inch from the theoretical spacing.

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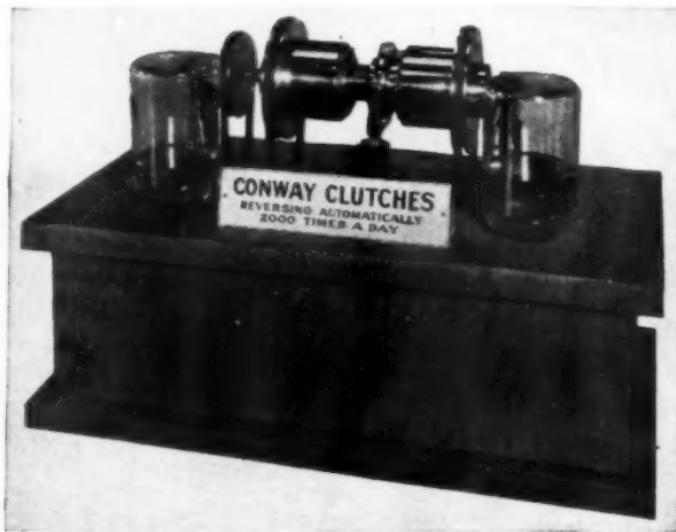
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Welding Design

By R. A. GAST, Mechanical Engineer
The Lincoln Electric Co., Cleveland, Ohio.

THREE are 3 methods of designing for welded steel construction and each method is used in its proper place. The methods are:

(1) The approximate or direct replacement of steel for cast iron. This involves the use of steel in place of cast iron, the sections being proportioned to the dimensions of the original casting.

(2) The conventional method wherein some account is taken of load or service conditions and the members, joints, etc., proportioned to that load, using established values for loading.

(3) The precise method wherein unit stresses are carefully figured and the design worked out in detail.



FIG. 1

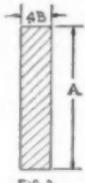


FIG. 2



FIG. 3

Fig. 1—Diagrammatic sketch of old casting. Fig. 2—Steel section having some deflection as old casting. Fig. 3—With same width, steel can be three-fourths as deep as cast iron.

Any approximate method of producing a satisfactory design will not necessarily obtain the most efficient use of material or lowest production cost. With these limitations in mind, the application of this approximate method may be made.

It is not always possible to know the loading, but the dimensions of the casting to be replaced are known. It is therefore, possible to work from these

dimensions and lay out the welded steel construction.

In most machines, deflection is a very important item, generally the governing one. The steel design therefore must have a deflection no greater than that of the cast iron. Assuming that one section of the old casting is an approximate rectangle as shown in Fig. 1, then the steel section for the same deflection will be as shown in Fig. 2.

For the same depth, the steel width should not be less than four-tenths of the width of the cast iron section. If necessary to maintain the width, then the depth for steel will be three-fourths that of the cast iron, Fig. 3. In one case a 60 per cent saving in weight and in the other only 25 per cent.

Quite frequently the section for cast iron looks something like an I-beam.

It has been shown that the greatest weight saving resulted when the depth was not reduced. Therefore, the depth will be kept the same. The width of the web and the thickness of the flange are reduced to four-tenths of the cast iron value, but the depth is the same as before. This is portrayed graphically in Fig. 4 where the steel section has been superimposed over the cast section. Note the difference in thicknesses of the section, the saving of weight effected by use of steel.

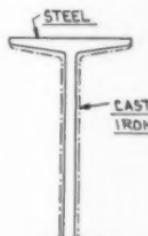


FIG. 4
Steel section superimposed on cast iron.

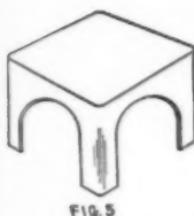


FIG. 5

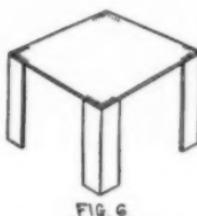


FIG. 6



FIG. 7



FIG. 8

Fig. 5—Simple base. Fig. 6—One type of welded steel base to replace Fig. 5. Fig. 7—Improvement of welded base by addition of connecting strips at top. Fig. 8—Welded steel base having appearance equal to original cast iron (compare with Fig. 5).

A summary of the "rule of thumb" method for determination of design evolves these general rules:

(1) For the same degree of rigidity, the thickness of the steel section should be $4/10$ the thickness of the cast iron section, other dimensions of the steel to be the same as for cast iron.

(2) Where strength is the determining factor with rigidity a secondary factor, the thickness of the steel section should be $1/3$ of the thickness of the cast iron section; other dimensions of the steel to be the same as for cast iron.

(3) Where strength is the determining factor and rigidity is unimportant, the thickness of the steel section should be $1/4$ the thickness of the cast iron section, other dimensions of the steel to be the same as for cast iron.

In these general rules, the ratios of required thickness of steel to cast iron are based on tabulated values of these materials also on 30,000,000 pounds per square inch as coefficient of elasticity for steel and 12,000,000 pounds per square inch for cast iron.

Specific Example—a Simple Support

To illustrate the direct replacement method of design, consider a simple base as shown in Fig. 5. Assume that this cast iron base is 18" x 21" x 15" high, weighs 162 pounds, has a section thickness of $1/2$ " and costs \$9.22 (at 6 cents per lb.).

Here, both strength and stiffness are the determining factors. Hence, in designing for welding, follow rule (1).

First consider the replacement of the cast iron with standard structural shapes and rolled steel plate.

Due to the greater strength and stiffness of rolled steel the various members of the arc-welded bases may be $3/8$ "

in thickness instead of the $1/2$ " section required for the cast iron base.

The arc welded steel base, Fig. 6*, is composed of one 18" x 21" x $3/8$ " plate for the top and four 5" x 5" x $3/8$ " angles for the legs. These members are assembled and welded as shown. The cost of this base is as follows:

Steel, 100 lbs. @ 3c.....	\$3.00
Cutting to size.....	.10
Welding, 40"— $\frac{3}{8}$ " fillet @ 10c ft.....	.33
(includes labor, power and electrodes)	
Overhead 200% of Labor.....	.86

Total cost of welded steel base, Fig. 6...\$4.29

*In this discussion of Methods of Design, drawings of welded parts are illustrative only, showing the assembly of component parts. Welding symbols such as are used for working drawings are not shown.

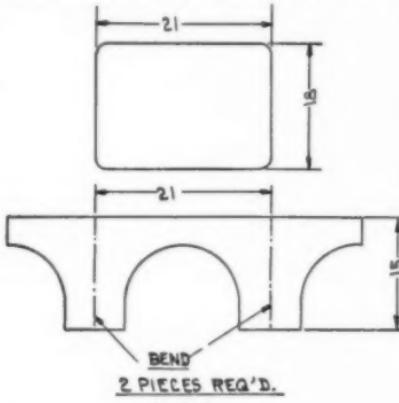


FIG. 9

Fig. 9—Three pieces of plate cut for welded steel base.

An improvement of design and appearance of the arc welded base may be obtained by the addition of an apron or rails connecting the top and legs

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as shown in Fig. 7. Thus, nine members assembled and arc welded as shown, form this base. The cost is as follows:

Steel, 111½ lbs. @ 3c	\$3.35
Cutting to size	.13
Welding, 90"-¾" fillet @ 10c ft.	.75
(includes labor, power and electrodes)	

Overhead 200% of Labor. 1.76

Total cost of welded steel base, Fig. 7. \$5.99

Compare the arc welded steel base, Fig. 8, with the cast base, Fig. 5.

The welded steel base consists of three pieces of ¾" plate cut and formed as shown in Fig. 9. The assembly and location of welds are shown in Fig. 8. The cost of this base is as follows:

Steel, 88 lbs. @ 3c per lb. (less scrap),	.32.64
Cutting	.15
Forming	.08
Welding, including labor, power and	

electrodes

12"-¾" butt weld @ 9c ft.09

48"-¾" fillet weld @ 6c ft.24

Overhead 200% of Labor.66

Total cost of welded steel base, Fig. 8. \$3.86

It should be noted that all the designs for the steel bases are calculated on the physical characteristics of welds made by a shielded arc, with the most modern equipment. Welding costs are also computed on this basis. Welding costs will be somewhat higher when other equipment is used.

A comparison of the total costs and weights of the cast base and the arc welded steel bases shows from 33% to 57% cost reduction.

DESCRIPTION OF BASE	COST	WEIGHT
Cast Iron, Fig. 5.	\$9.72	162 lbs.
Arc Welded Steel, Fig. 6.	4.29	100 lbs.
Arc Welded Steel, Fig. 7.	5.99	111½ lbs.
Arc Welded Steel, Fig. 8.	3.86	88 lbs.

(NOTE—Part II will appear in an early issue.)



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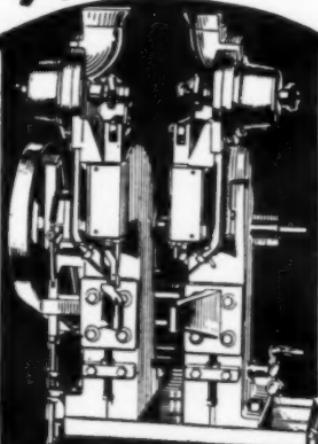
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New Trends and Developments

THE newest development in the battle between die-casting and assembly spot welding for complicated units is a process created for a leading automobile company for assembling its 1941 radiator grilles.

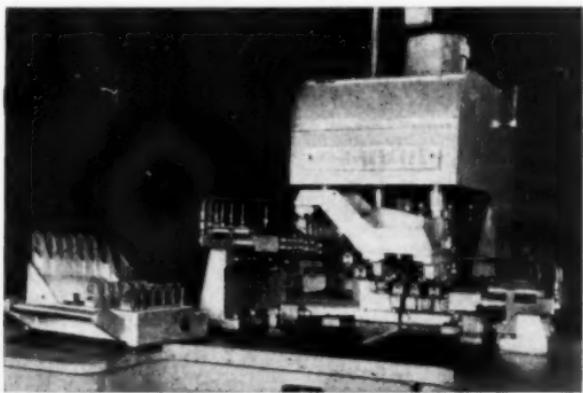
With this rather unique equipment some 1,000 stampings are being assembled with 4,000 spot welds into 100 complete radiator grille halves per hour. Highlights of this equipment include

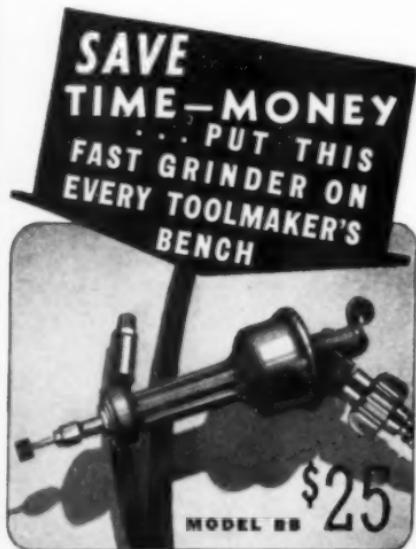
1. Use of rubber tired movable jig - fixtures which are the lower electrodes during welding.
2. Multiple spot welding in series with 20 "guns" per station, each having two self-equalizing tips—2 welds per gun. Equal pressure is provided



Two welding stations are provided, with two men per station.

also to all welding guns.
4. Hand clamping of work is entirely eliminated.
5. Entire sequence of operations—for loading parts into jig, and unloading for both radiator grille halves—requires but 5 by 12 feet of floor space.
The machine has two dual welding stations, and two jigs mounted on rubber tired wheels are used with each station. Each station is manned by two men. Each man handles one of the movable jigs which he loads, shoves into machine for welding and pulls out for unloading. Thus while one operator is loading his jig, the second operator is welding the parts on





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his jig, and vice versa.

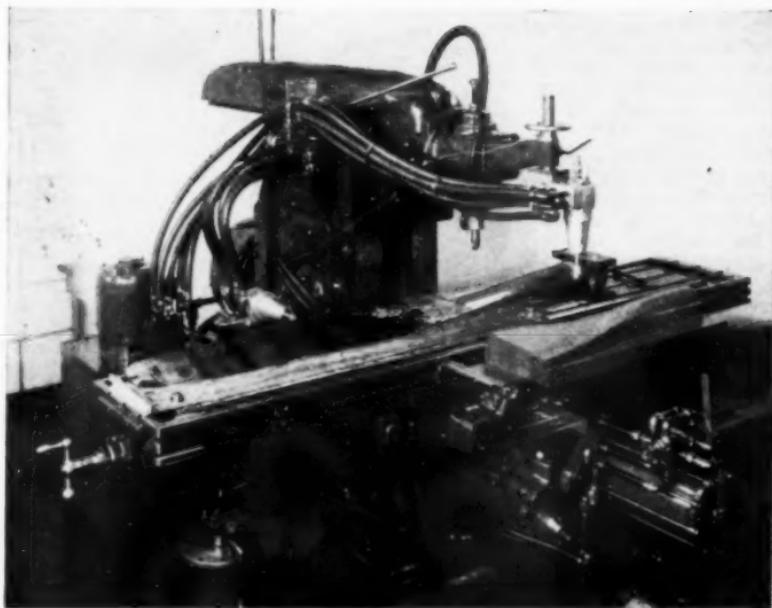
In operation, a jig is loaded with the component parts of a grille half and is then moved into welding position. Guides and locking pins mounted on the table locate the fixture. When the wedges of the upper electrode descend they clamp the work held in the lower electrode securely in position. An air operated clamp of the same form as the grille, presses the work in place on the welding jig and clamps the latter firmly on the table. This compresses springs which support the wheels and permits locating pins at either end of the jig to engage locating holes.

Two welding tips are mounted on each gun, in such a manner that they are entirely self-equalizing and thus assure uniformity with double welds with one gun. The unit coordinates the welding of two guns simultaneously. In rapid succession, welding current passes from the transformer in the base of machine through two tips of one gun, through the mobile jig and back through the two tips of a second gun to complete four spot welds at one time. Twenty spots in all are required for each grille half. When the welding cycle has been completed, the jig is automatically released for removal and unloading. The right grille half is welded at one station—the left is handled at the other. After an operator loads the work at the left of the station, he rolls the jig to the right and into welding position. Following the welding he returns to starting position at left. Thus, two operators at each welding station alternate with each other at the welding position, each loading and unloading at his own position without interference.

No hand clamps are used or needed—clamping being done by the wedges of the upper electrode. The jig was designed so that parts can be "dropped" into position, thus eliminating the time-consuming necessity of "fitting" parts in place.

The units are available in several standard sizes.

TURCHAN FOLLOWER MACHINE



One of the many applications of the Turchan Follower Machine is shown in connection with a large milling machine.

The Defense Program and the upward trend of Industry have served to emphasize the acute shortage of skilled labor.

The solution lies in the use of speedier, more versatile machines that will meet production needs with the labor resources available.

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The Turchan Surface Contouring Attachment is readily adaptable to any standard type milling machine or boring mill, either vertical or horizontal, enabling a standard machine to mill irregular surfaces or to handle precision die-sinking operations heretofore requiring costly special machinery and highly skilled operators.

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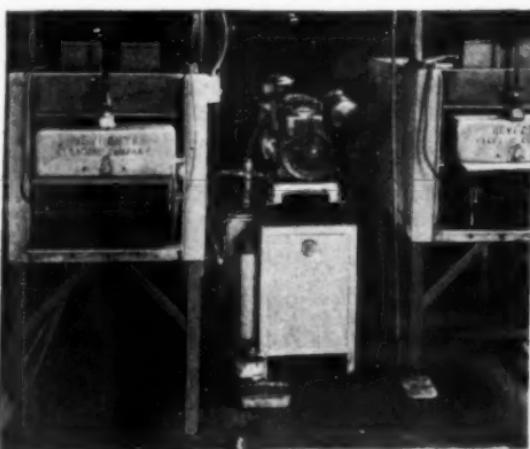
2—Utilizing Exhaust Gas

A new gas preparation unit utilizes the exhaust from an internal combustion engine as an atmosphere in furnaces, for the prevention of decarburization, carburization, and scaling. One of these units is shown located between two furnaces.

It is claimed that the equipment is unique in several features. The carburetor is fitted with an indexing dial to afford ready adjustment for various atmospheres. The carbon monoxide content of the exhaust gas can be up to 12-1/2% with the carbon dioxide down to 5%. The exhaust gases may be used in processing as soon as the air is purged from the furnace. Suitable means is provided for dehydrating the exhaust gases. The engine may be operated from lead-free gasoline, or from bottled gas such as propane.

A blower fan permits developing a constant load on the motor. Ordinarily, the engine is operated at $\frac{1}{2}$ to $\frac{2}{3}$ maximum r.p.m., for long life of the engine parts.

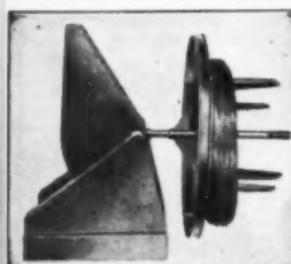
The explosion temperatures of the engine are far in excess of any temperature at which the exhaust gases may be used for protective purposes. In the older burner combustion method, when a mixture of air and gas is burned by direct combustion at a temperature of about 2200° F., the temperature drops when increasing the rich-



ness of the mixture to obtain a higher CO content. Such an atmosphere, when used at the temperatures in the range for high speed steel, has a further reaction detrimental to steel. No such reaction on the steel takes place from the engine exhaust. It is reported that a certain high speed steel at 2250° F. showed four thousandths of an inch decarburization from burner combustion gas, and no decarburization in the atmosphere from the internal combustion engine.

3—Magnetic Filtering

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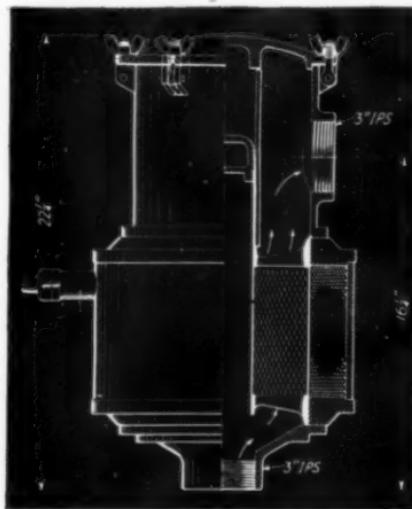
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sive iron particles—even as microscopically fine as one micron—which may pass through conventional filters, screens and other commonly used purifying devices.

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It is pointed out that particles up to 1/400 inch in size, which are not removed by the ordinary edge-type filters, can break the oil film and bridge the bearing clearances. Also, porous-type filters, because of their low capacity, high pressure drop and clogging characteristics, cannot be used full flow. They also may have the disadvantage of removing additives from compounded oils.

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The illuminating head supplied with the instrument, carries a special tubular lamp the clear portion of which is 6" long. It is provided with an adjustably inclined mirror, which enables the observer not only to look along the inner walls of the bore, but also to obtain a direct view at right angles to the wall. The image of the wall formed by the mirror appears in the center of the field of view. The view is such as would be seen were it possible to place the eye within 2" to 8" of the point being inspected.

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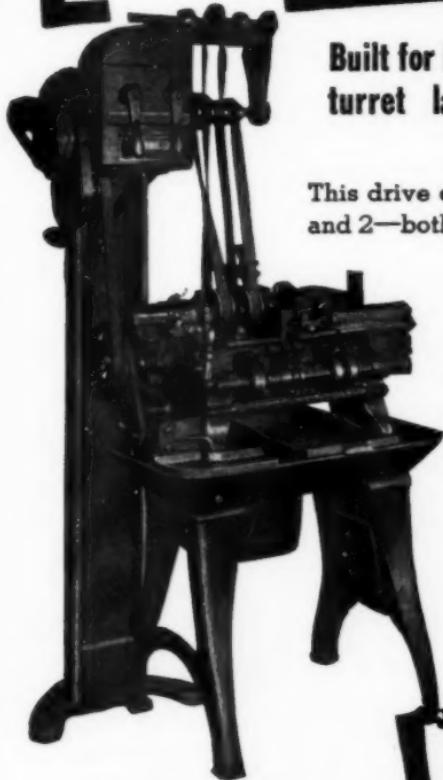


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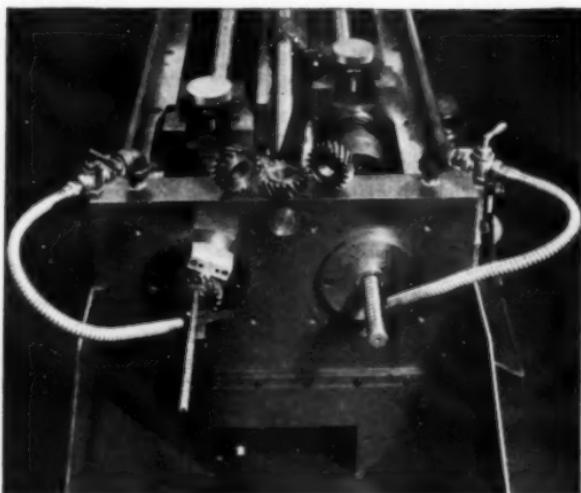
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5—Gear Broaching

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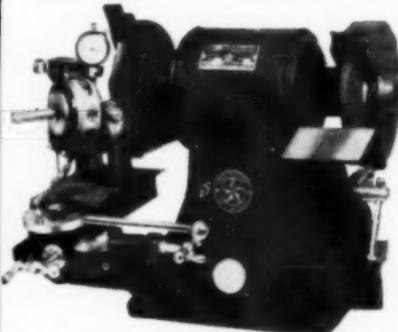
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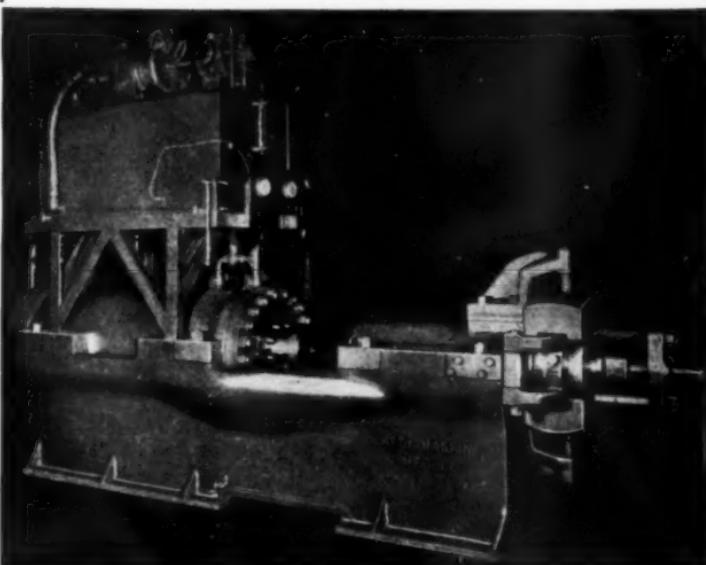
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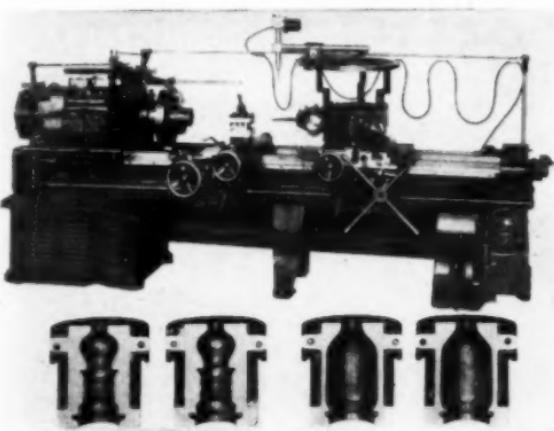
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HART'S MILLING FIXTURES



These fixtures will make themselves popular and profitable in your shop. They are easily kept clean to receive the work and may be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. A very easy setup and fool proof, with a grip that holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes— $\frac{3}{4}$ " to 4". We can also supply dividing heads to be used with the fixtures.

Write for descriptive circular.

HART MACHINE CO.
26 Mather St., Dorchester, Boston, Mass.

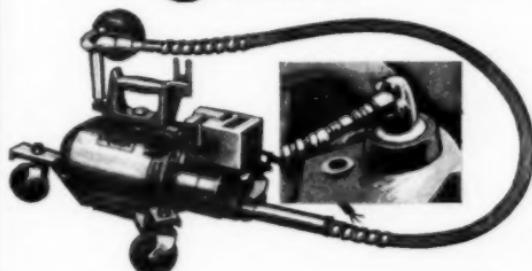
GREATER PRODUCTION

at LOWER COSTS with

Mall
TRADE MARK

Flexible Shaft
GRINDERS

A Type and Size for Every Job!



MALL 3 H. P. geared head grinder—
delivers 5500 r. p. m. Other models
 $\frac{1}{2}$ H.P., $\frac{3}{4}$ H.P., 1 H.P. and $1\frac{1}{2}$ H.P.
All styles of mountings.

Fast and efficient production tools for all types of industrial grinding and finishing. They eliminate the need for costly compressed air and make power from the constant speed, aluminum frame, dust and vaporproof or ventilated type, ball bearing motors available in any position. The same power unit can be used for sanding, wire brushing, polishing and grinding.

*Speed!
Lightweight!
Portability!*

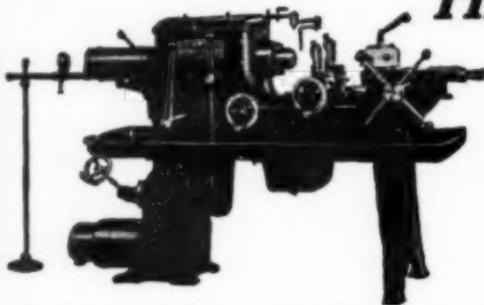
*Two to Three
Times More Power
in the Operator's Hands!*

*Large, husky, constant
speed, aluminum frame,
ball bearing motors!*

*Write TODAY for FREE demonstration
and full information.*

MALL TOOL COMPANY

7742 SOUTH CHICAGO AVENUE CHICAGO, ILLINOIS



HERE IT IS!

The new **SIMMONS** No. 2 (1 1/4") Turret Screw Machine offered to you with three distinct advantages:

- Low Cost
- High Precision
- Quick Delivery

The **SIMMONS** Micro-Speed Drive, equipped with push-button control and magnetic brake, offers a range of spindle speeds up to 1,500 RPM. The operator can select the speed best-suited by a mere turn of a hand wheel.

Spindle mounted on Timken Precision Tapered Roller Bearings. Levers within immediate reach of operator. Head cast solid with bed, insuring rigidity.

Write to-day for complete details.

SIMMONS MACHINE TOOL CORP.

1725 Broadway, Albany, N. Y. . . Singer Bldg., New York City

further reduced through the savings in time required for polishing and burnishing.

In operation, the two mold halves are clamped together in the lathe by means of a special chucking device. After facing one end, the operator moves the turret mounted boring bar up to starting position and then starts the duplicating control mechanism. When the internal cut is completed, the work is removed and reversed in the lathe to complete the mold by facing the opposite end.

The template for contour boring is mounted on the head of the lathe; the tracer head is mounted on the turret and the tracing finger follows the template and transmits a series of interrupted electric impulses to the control unit which, in turn, actuates the cross feed of the boring bar in exact conformity with the template.

To assure close conformity of the work with the template, a solenoid actuated clutch, operating from the tracer head, and mounted on the cross slide feed, provides an exceptionally fine control for feed of the cutting bar.

7—Magnetic Starters

A new line of across-the-line magnetic starters for use with multi-speed squirrel cage motors of from 220 to 600 volts, 1 to 100 h.p. is available. These are designed to start the motor across-the-line- at any speed. Different speeds are obtained by changing the connections to the motor so as to change its number of poles. Such schemes are commonly employed on machine tools, fans, mixers, conveyors, etc.

Starters are available for the following types of multi-speed motors in 2, 3, or 4 speed types:—1. Constant horsepower. 2. Constant torque. 3. Variable torque. 4. Single winding motors. 5. Double winding motors.

Features include pushbutton speed selection, accurate overload protection, low voltage protection, arc quenchers, and front of board wiring with accessible terminals.

Optional operational features include selective speed control, compelled slow speed start, automatic sequence acceleration and deceleration.



WHERE "GOOD ENOUGH" WON'T DO

There are no "unimportant" parts in an airplane engine. Efficiency and dependability demand perfect performance all along the line. Consequently the only standard for selecting materials should be ability to meet the requirements.

Nickel-Chromium-Molybdenum and Nickel-Molybdenum oil hardening steels are being chosen for many engine parts such as crank shafts, pins and accessory gears because of their demonstrated capacity for doing their jobs. Not only do they develop the necessary strength and

toughness, but also the requisite hardness, and they machine in the fully heat treated condition.

Thus they give the engine manufacturer confidence in the performance of the parts and help keep his production costs within reasonable limits.

Complete technical data about the various Molybdenum steels will be found in our book, "Molybdenum in Steel". This book will be sent free on request to executives and production heads.

PRODUCERS OF MOLYBDENUM BRICKETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

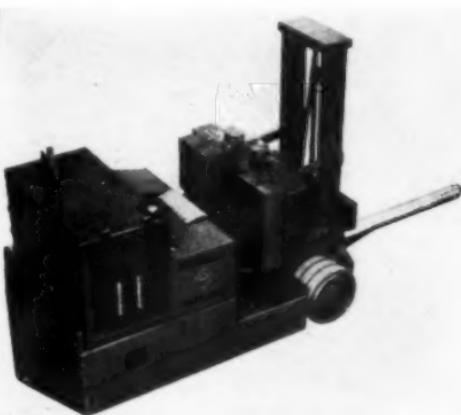
Climax Molybdenum Company
500 Fifth Avenue • New York City

8—Heavy Duty Handling

Stepping up the width of strip steel along with the tendency to speed up the mills, has occasioned the development of faster, larger, ram and fork type trucks such as the model shown. It is of 16,000 pound capacity, front wheel drive, trail wheel steer, built for tilting or non-tilting, for accommodation of ram, fork or up-ending device.

The steering is by means of a master control for motor powered steering mechanism located at one side of operator's position in center of truck. Operator is where he can see ends of the fork or ram when engaging the load. Heavy duty motor drives all front wheels through triple gear reduction. Hydraulic brakes fitted.

Tilt and hoist units are located between control dash and load. Comfortable driving position on deep rubber pads is provided for operator with battery on deck behind him.



All welded extra heavy frame of $\frac{1}{2}$ " to 1" plate and heavier bar construction provides sturdy anchorage beneath for the various elements such as rocking special alloy steel trail axle. Drive tires are 22- $\frac{3}{4}$ " x 18" and Trail tires (four) 18" x 7".

HIGH SPEED

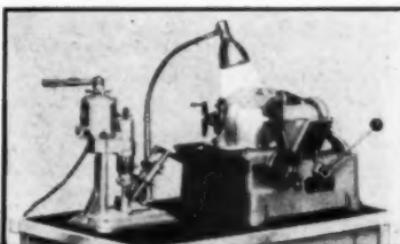
Precision Milling and Boring

This machine is specially designed for High Speed Precision and Production Milling and Boring pockets, slots, angles, and compound angles up to 90° without disturbing the work in the machine. Rigidly constructed of best materials to prevent vibration. Working surface of table 6"x24". This is not just "another" machine. It merits your investigation.



WRITE TODAY.

JACKSON MACHINE & TOOL CO.
JACKSON MICHIGAN



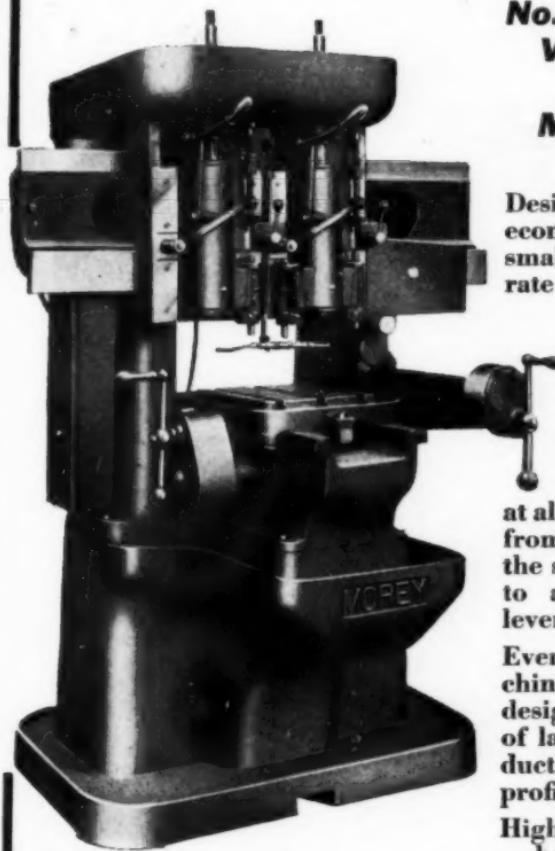
PUT IT TO TEST

Prove the difference that VIMCO-LIGHTING will make on your machines. Localized, high intensity lighting will spot your working area and speed up production. Time-tested on Hall Mfg. Company's well-known grinders, VIMCOLIGHT has again proved its worth. Write for an introduction to VIMCOLIGHT superiority.

VIMCOLIGHT

VIMCO MANUFACTURING CO.
109 CHENANGO ST. BUFFALO, N.Y.

CUT MANUFACTURING COSTS of SMALL PARTS with this



**No. 12M High Speed
Vertical Profiler
and
Milling Machine
Motor Drive**

Designed especially for the economical manufacture of small parts requiring accurate interchangeability.

A unique feature is provision for dropping the table, increasing distance from spindle end to table to a maximum of 12", maintaining at all times the same height from cross rail to floor and the same height from floor to all spindle operating levers.

Every feature of this machine has been planned and designed to save you hours of labor and increase production, thereby increasing profits.

Highest class workmanship — best materials obtainable, both make this machine an outstanding value.

Write for information today.

MOREY MACHINERY CO., INC.

410 Broome St.,

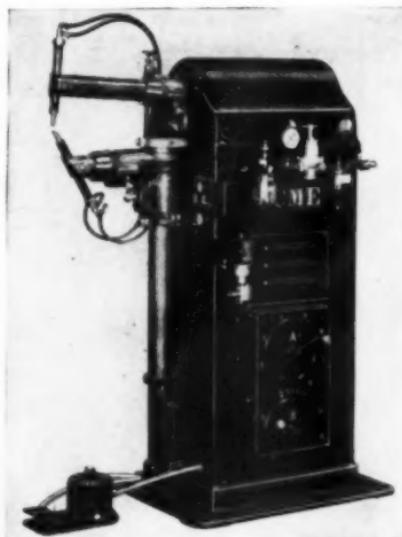
New York, N. Y.

9—Air-Operated Welders

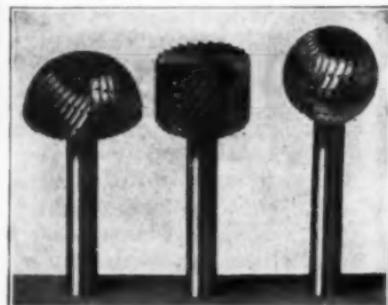
A complete new line of air operated rocker arm type spot welders in transformer capacities of from 10 to 75 KVA is announced.

These welders come completely equipped with automatic weld timers and welder service magnetic contactors and are offered in various styles actuated by a foot valve and limit switch; by a solenoid operated mushroom type floor switch, or by a specially designed

two stage toe operated floor switch. They are available in either single spot non-beat or automatic repeat operation.



FORD GROUND CUTTERS



Just a few of the many standard shapes which are carried in stock.

M. A. FORD MFG. CO.
413 PERSHING AVENUE
DAVENPORT, IOWA

Advantages claimed for the air operated spot welders are faster production, uniform spot welds and elimination of operator fatigue.

Other highlights include heavy fabricated steel bases, transparent bowl pulsating type lubricators, jewelled pressure gauges, bronze pressure regulators, test switches and piston packed air cylinders. Heat regulation is available from 6 points to 48 points.



Motorize Your Tools with H & Z Motor Drives

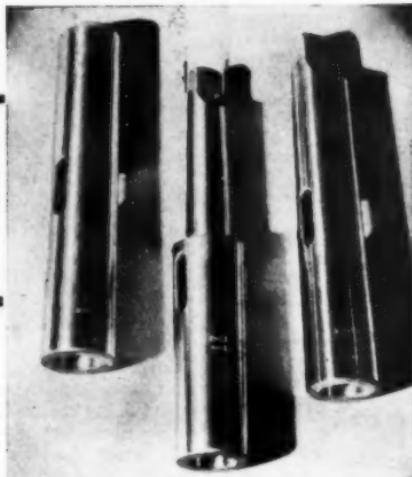
Speed up production, increase plant efficiency and lower costs by equipping your machine tools with H & Z Motor Drives. Specially designed to meet particular needs.

H & Z engineers are prepared to survey your plant, submit recommendations and make installations without interrupting production.

Write for particulars.

HERTZLER & ZOOK CO., Belleville, Pa., Pioneers Since 1925

10 times LONGER LIFE with MIDWEST HARDENED and GROUND SLEEVES



THESE MIDWEST sleeves are scientifically hardened and then both the inside and outside tapers are precision ground. This method of manufacture has proved that a MIDWEST sleeve will give from ten to twenty times longer life compared to the ordinary soft steel sleeve. Production spoilage caused by misalignment of marred and pitted soft sleeves is now definitely eliminated. MIDWEST hardened sleeves can absolutely reduce your tool costs.

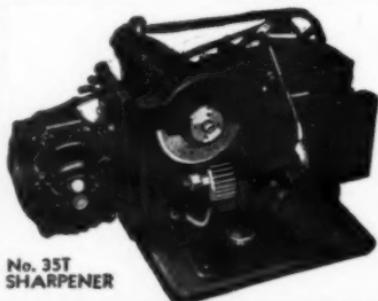


Send for your copy of MIDWEST's complete tool catalog TODAY.

Manufacturers of a complete line of precision metal cutting tools for thirty years.

Representatives located in all major cities.

MIDWEST TOOL & MFG. CO.
2347 W. Jefferson Ave. Detroit, Mich.



No. 35T
SHARPENER

AUTOMATICALLY SHARPENS METAL SAWS IN GANGS

Up to $5\frac{1}{2}$ " diameter and up to $1\frac{3}{4}$ " thickness.
100 SAWS OF 26 GAUGE CAN BE SHARPENED AT ONE TIME.

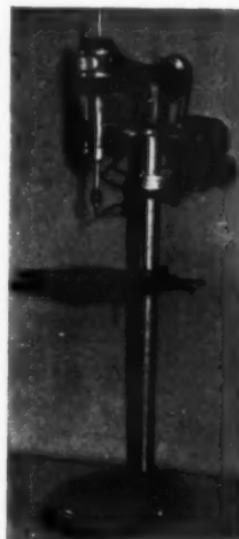
The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

WRITE FOR CIRCULAR

The WARDWELL MFG. CO.
3165 FULTON RD. CLEVELAND, O.

10—Speedy Tapping

A new tapping machine incorporates a clutch, mounted on the drive shaft, leaving the tapping spindle free and therefore rigid. Movement of the clutch lever decreases or increases pressure on the clutch drive plate, thereby controlling the pressure at which it is desired to have the clutch slip, avoiding tap breakage. The type of clutch used is said to permit tapping $\frac{1}{2}$ "-13 threads in boiler plate at 360 r.p.m.



LITTELL Air-Blast Valve for Faster Safer Production

PAYS its cost in a few weeks time in — increased production — greater safety — economy of air. Automatically ejects pieces. Operator's hands are never in danger zone. Quickly adjustable air nozzle.

Automatic Roll Feeds—
dial feeds, magazine feeds, hopper feeds, for punch presses. Reels for coiled stock. Send for Circulars.

F. J. Littell Machine Co.
4153 RAVENSWOOD AVE., CHICAGO, ILL.

Then, changing the pressure on the clutch, the speed and the tap and within 90 seconds everything is ready to tap 10-32.

No pressure is necessary on the handle when the tap enters the work. All that's required is to set the gauge for the depth desired (when first setting up), start the tap and the machine makes the complete cycle ready for the next hole, permitting a claimed tapping speed of over 30 holes per minute.

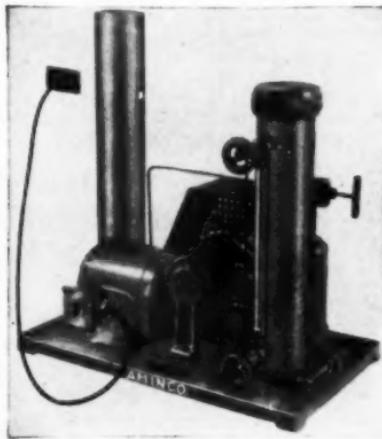
The spindle revolves on ball bearings within a 2" quill. Four speeds are provided—260, 345, 560 and 870 r.p.m. There are many advanced features.

11—Hydraulic Pressures

A new motor-driven hydraulic pump capable of developing pressures up to 6000 lbs. per sq. in., is now available.

It is especially applicable for use in creating high test pressures for catalytic hydrogenation work, for determining the bursting strengths of cylinders, spheres, etc., for operating high-pressure and hydraulic intensifiers, and for

determining the effects of high pressures and their sudden release on various materials.



It consists essentially of a geared-head motor (for operation on 115 or 230 volts a-c. or d-c.), reservoir and compression chamber, mounted on a substantial cast iron base. Theoretical displacement per hour is 553 cu. in. Working volume of the reservoir, 1300 ml.; actual volume, 3000 ml. Working and actual volumes of the compression chamber, 1300 ml. Tested to 9000 lb. per sq. in.

12—Black Finish

A low temperature black bath was originally used for coloring gunsights—but its superior appearance and

longer-lasting finish started gun makers using it as a bath for gun barrels and other black parts.

It is said to offer a great reduction in finishing time; the complete job is done in a matter of a few minutes, as compared with several hours—and the finish itself is a particularly rich, deep black that will not rub off.

Another feature of interest is the low temperature at which it is used—ranging from 290° to 300°, which does not in any way affect any heat treatment

SPECIAL TOOLS AND GAGES DESIGNED and BUILT



DIES—JIGS AND FIXTURES LARGE OR SMALL

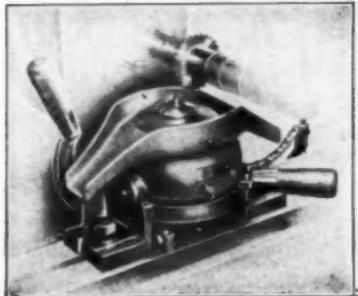
COMMERCIAL JIG BORING

We can handle your jig boring work at reasonable prices on our 18¹/₂ x 36¹/₂ Pratt & Whitney jig borer. Prompt service.

COMPLETE HEAT TREATING EQUIPMENT

Have been delivering satisfaction since 1929. Let us help you on your tooling problems.

QUALITY TOOL & DIE CO.
RAY W. RICE, Manager
401 N. Noble St., Indianapolis, Ind.



Mill Over 1,000 Parts Per Hour WITH THE NEW Dearborn Automatic Chucking and Indexing Fixture

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN
72 S. CLIFF ST. ANSONIA, CONN.

previously applied. It forms no deposits of dirt or film on threads or other surfaces, does not harden, draw or embrittle, and the residue washes off freely in cold water.

It is offered for any kind of ferrous metal blacking, in any industry. Wire and spring makers, screw manufacturers, and makers of parts for clocks, metal toys, hand tools, cameras, tacks, drills and pins should be interested.

The M-B "Utility" Pneumatic Grinder. Model U.—T. R.

A 60,000 R.P.M. Unit



Steel Housing (For Safety)

A WORTHY COMPANION TO OUR FAMOUS "SUPER SPEED" MODEL S. S.—S. R.

SPECIAL GREASE SEALED BEARINGS
NO LUBRICATION REQUIRED.

AN ABUNDANCE OF POWER.

OTHER MODELS, ALSO AIR LINE FILTERS AND AUTOMATIC AIR LINE LUBRICATORS.

Write for details and data on free trial offer.

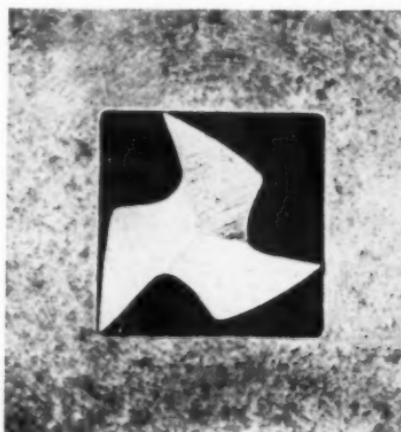
M-B PRODUCTS

130 E. LARNED ST. DETROIT, MICH.
Export Office: 44 Whitehall St.
New York, N. Y., U. S. A.

13—Drilling Angular Holes

Angular holes are of obvious advantage in many places instead of round holes, but heretofore they have been studiously avoided because of their cost of production.

Equipment is now available for production drilling of triangular, square, pentagon, hexagon and octagon holes



in steel, iron, brass, aluminum, bakelite and other materials. It can be used in vertical machines such as drill presses, or in horizontal machines such as engine lathes, turret lathes. Holes up to $\frac{3}{4}$ " are seldom more than .002 or .003" large—the tool having a tendency to cut a trifle oversize rather than undersize. The drill or cutter used is



GOOD NEWS! for DIE MAKERS

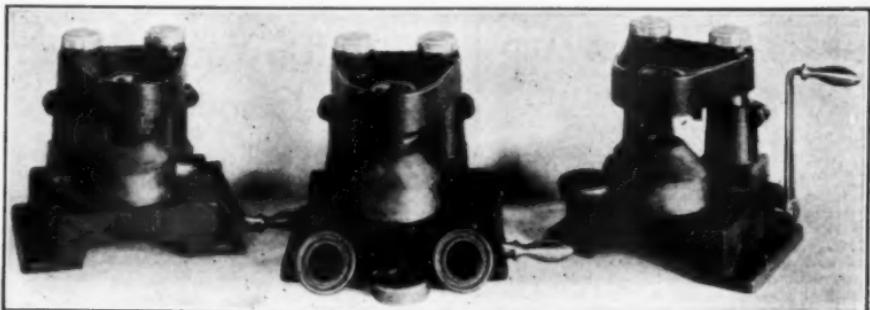
Transfer Points Eliminate
Guesswork in Die Making

There's no chance for error when you use transfer screws as markers in setting dies. Points are of uniform height above hex base. Six accurately made and hardened screws nest in a special holder with hex wrench tip. Made in $\frac{1}{16}$ " to 1" diameters.

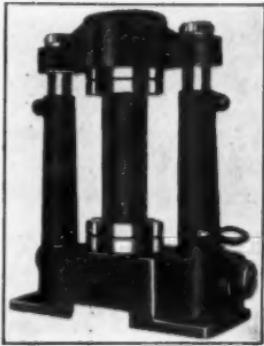
3/16"	\$1.50 per set	5/16"	\$1.25 per set	7/16"	\$1.40 per set
1/4"	1.20 "	3/8"	1.35 "	1 1/2"	1.50 "

HEIMANN MFG. CO.,

URBANA, OHIO

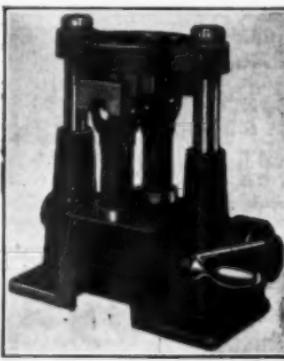


Let Us Solve Your Drill Jig Problems . . .

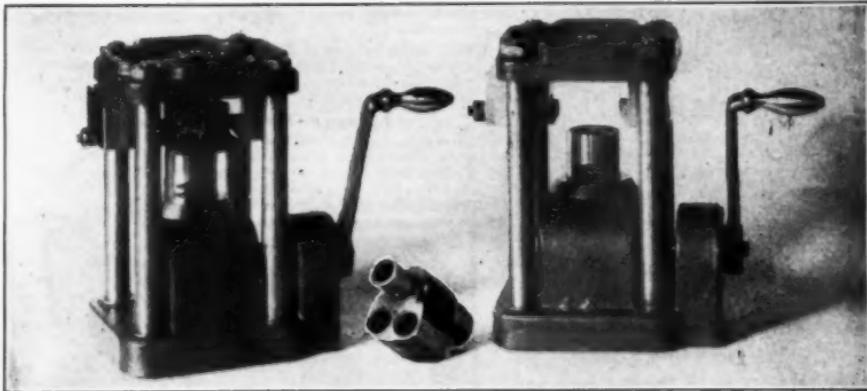


Whether it's Diesel Injectors or Cylinder Heads, we have the experience . . . the modern facilities to equip you with Siewek Rapid Drill Jigs that will pay dividends in time and labor savings on high speed production.

Send for catalog showing our complete line.



THE SIEWEK TOOL COMPANY
FERNDALE, MICHIGAN



MICHIGAN BOULEVARD
WHERE
CHICAGO
LIVES

• The pulse of the city—Michigan Boulevard. Chicago works and plays to the tune of its rhythmic hum. In the most convenient location on this famous thoroughfare, Hotel Auditorium provides spacious pleasant rooms, excellent service and superb cuisine, at reasonable rates.

WITH BATH from \$2.50
WITHOUT BATH from \$1.50

GEO. H.
MINK
Mgt.



MICHIGAN
AT
CONGRESS

**HOTEL
AUDITORIUM**

**What Do You Demand
In a Good Hotel?**

Do you like well-appointed, homelike rooms, comfortable beds, good food at reasonable prices, a safe place for your car?

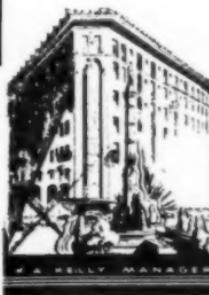
Must **your** hotel be conveniently located to business, stores, theatres?

If those are the things you demand in a good hotel, you'll like Hotel Lafayette.

Rates

Single..... \$2.50 up
Double..... 4.00 up
Special rates for 4 or more.

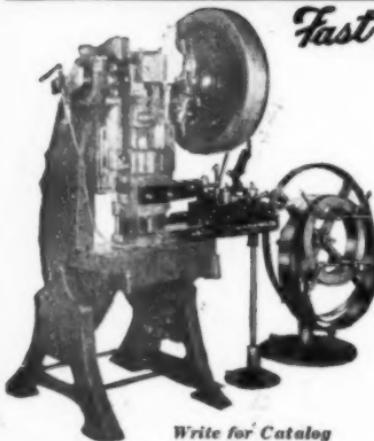
Write for Folder J.



Hotel LAFAYETTE
BUFFALO, N.Y.

WITTEK ROLL FEEDS
FOR ANY MAKE AND SIZE OF PUNCH PRESS

Fast Safe Accurate Automatic



Write for Catalog

WITTEK MFG. COMPANY
4305 W. 24th Pl. Chicago, U.S.A.

Keep up with production schedules, yet keep costs down by installing Wittek Automatic Roll Feeds—the feeds that have made automatic punch press operation practical on even comparatively short runs.

They can be installed on any make or size punch press without alterations . . . will handle any coiled stock and feed from right to left, left to right, back to front or front to back in any length from 6" to 24" per press stroke at catalog speed or faster.

Improved Operating Principle

Improved, simplified method of operation insures rapid smooth, accurate feeding. Made in 3 types, Wittek feeds save dies, reduce scrap and cut maintenance costs to a minimum.

**WITTEK ADJUSTABLE
REEL STAND**

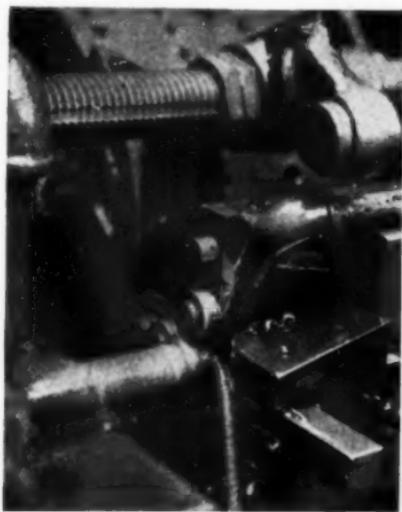
6 types—a type for every job. Will handle any stock (metal, foil, paper, etc.) Wittek No. 3 (illustrated) has automatically expanding coil holders that center the coil and assure maximum production by eliminating looping, tangling and backlash of stock.



similar to an end mill in operation. It is held in a full floating chuck which allows the requisite freedom when turning the corners in the guide plate.

14—Tap Blank Production

A 50% increase in production of $\frac{1}{2}$ " tool-steel tap blanks has been achieved through the development of an automatic screw machine installation employing cemented carbide tooling.



The machine, a Cleveland automatic, is equipped with multiple tooling for turning, necking, and cutting off the blank. Carbide tools are used for the first two operations, high speed for the cut-off. Cutting speed is 185 ft. per minute with a spindle speed of 1380 r.p.m. and a feed of .004" per revolution. Material is 110 carbon tool steel.

In addition to increasing production, the new installation has also permitted longer runs between grinds, tools being ground only once per 8 hour shift, reducing machine down-time.

NOTE—If you desire further information concerning any of the foregoing items, please address the Editor, giving the paragraph number.

TROYKE ROTARY TABLES



Moderately
Priced

Made in 9", 12", 15", 18", 21", 25".
With or without dividing plates.
Ask your dealer or write us for complete catalog.

ALFRED A. TROYKE
4422 Appleton St., Oakley, Cinc., Ohio



The Standard of QUALITY

All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

As Cutter Specialists since 1919 we are able to offer the highest *quality* and *service* at *attractive prices*.

Write today for prices. *Few Territories Open.*

QUALITY TOOL WORKS
WAUKEGAN, ILLINOIS

\$25 BUYS A POSTEL (f. o. b. Minneapolis) DIE FILER



A dependable, precision tool that will soon pay for itself.

Write for full information

The Postel Filing Mch. Co.
915 Washington Ave., So.
Minneapolis, Minn.



Over 60

**BOICE-CRANE Models to Choose From
for Production—Tool Room—Job Shop**

Are these your problems? How to keep up drilling and tapping production without investing thousands more for equipment? Tool room behind schedule for lack of immediately needed drilling and tapping machines? A tough drilling job requiring an expensive special machine you can hardly afford?

Then, Boice-Crane's new Drill Press Book will help you solve them!

The 64 different Boice-Crane Drill Presses and separate heads and parts for special machines listed, meet practically any tooling need. Each one is priced low—has capacity and ruggedness to stand 3-shift day punishment that will astonish you. *You tool up at a total cost of a few hundreds instead of thousands!*

IMMEDIATE DELIVERY

Boice-Crane can deliver NOW—when you need the tools, whether it's one or twenty-five machines you need.

Write Today

for the NEW Drill Press Booklet, prices,
and complete catalog of other Boice-
Crane cost saving power tools.

No. 2600 Bench type,
15 inch, $\frac{3}{8}$ " cap.,
either chuck or No. 2
M. T. spindles..... \$65.00



BOICE-CRANE COMPANY

1729 NORWOOD AVE.
TOLEDO, OHIO

What's New in the Industry

Buffalo Forge Develops New Drills

TWO interesting new drill presses are presented by Buffalo Forge Co., 161 Mortimer St., Buffalo, N. Y.

The "RPMster" shown at the left, features instant speed change, efficient V-belt drive, 6-spline alloy steel spindle, positive drive all-gear semi-automatic feed and alloy steel back gears.

It is built in two sizes—No. 3 with a capacity of $1\frac{1}{2}$ " in cast iron and No. 2 with a rated capacity of 1". Overhang on both is 13", drilling to the center of a 26" circle. Can be furnished with or without back gears—with or without power feed. Ample space under the spindle nose (27") is provided. Raising blocks can be provided to increase this space if desired.

The heavy ribbed table has a working surface 23"x22", surrounded by an oil and chip channel.

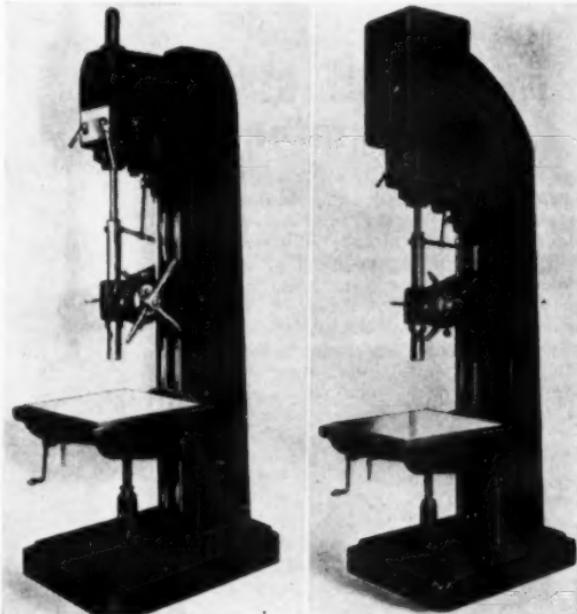
Although the overall height is approximately 100", all controls are within easy reach. Spindle travel on the No. 3 is 8"—and on the No. 2, 6". Speed range on the No. 3 is 150-2000 and on the No. 175-3000 r.p.m.

The new Motor Spindle Drill, shown on the right is of rugged construction. The No. 2 size has 8" and 13" overhang and the No. 3, 13" overhang only. Pedestal models only are available, 1 to 6 spindles.

The No. 3 machine is powered with a

3 h.p. motor, while the No. 2 is driven by a 2 h. p. motor.

Can be furnished with or without



back gears, with or without power feed and with or without motor reverse for tapping.

One of the latest developments in motor design is employed, viz., the hollow shaft motor. These are semi-enclosed, self-ventilated, and full ball bearing mounted.

Two h.p. motors are available in three speed ranges: — 3600-1800-1200-900; 1800-1200-900-600 and 1200-900-600-450.

The 3 h.p. motors are available in but



QUICK, DURABLE REPAIRS No Chipping

Use RUGGEDWEAR RESURFACER for patching or resurfacing entire areas . . . indoors or out. Amazing wear resistance. Made with Chrysotile and Cellulose. No chipping or cutting required. Simply sweep, mix and trowel on. Knits permanently to old surface . . . leaves no joints or crevices to become chipped or clogged with dirt. Provides firm, smooth, durable, silent wearing surface immune to heavy traffic. Resilient and non-tiring—adds to plant and worker efficiency. Dries fast.

Costs only 10 to 14¢ per square foot. Latest HAND BOOK OF BUILDING MAINTENANCE sent FREE when requested on business letterhead.

MAKE THIS TEST!

FLEXROCK COMPANY
2305 Manning St.
Philadelphia, Penna.

Please send me complete RUGGEDWEAR information . . . details of FREE TRIAL OFFER—no obligation.

Name _____

Company _____

Address _____

City _____ State _____

one speed range—1200-900-600-450.

These represents the four "open" spindle speeds. The back gear ratio is 4:1. Two types of motors are available—"K" for straight drilling and "KR" for reversing service.

On all models, maximum distance, spindle nose to table is 27". Adjustment range of sliding head is 8". Table adjustment range is 18". Adjustment range of spindle nose is 14" on the No. 2 and 16" on the No. 3.

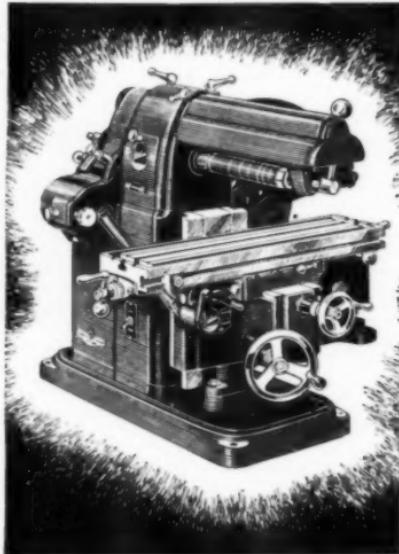
Working surface of table is 18" x 14" on the No. 2 with 8" overhang; 23" x 22" with 13" overhang models.

Rated capacity of the No. 3 is 1½" in cast iron; of the No. 2, 1" in cast iron.

Full details are given in new bulletins.

Atlas Presents New Milling Machine

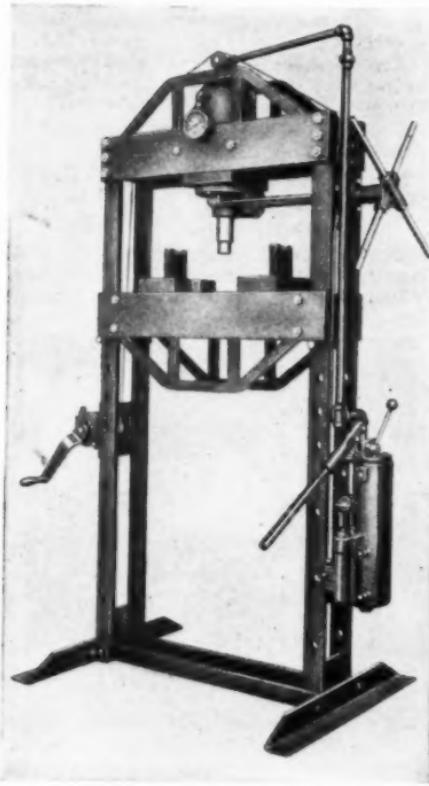
An attractive new milling machine had its premier showing recently at the New York Fair. It is made by The Atlas Press Co., 1050 N. Pitcher St., Kalamazoo, Mich.



The overall dimensions are 25½x32½x 22" high. Base dimensions are 20½x 178½". The drive motor recommended

KRW HYDRAULIC ARBOR PRESSES

HAVE SPEED AND POWER FOR INDUSTRIAL USE

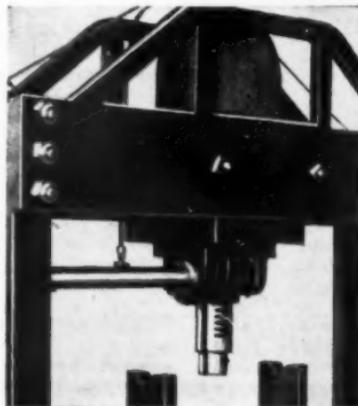


When you purchase a KRW Hydraulic Arbor Press, you really get 2 Presses in one—a Mechanical Press and a 2 speed Hydraulic Press. Note the rack and pinion mechanism in the illustration below, operated by the extensible pivoted cross-

arms. That's the Mechanical Press. It's fast and accurate, capable of Ram pressure up to 3 tons. You will find many operations that can be done quickly on this Extra Press.

The rack and pinion mechanism serves still another, equally important function. A spin of the pivoted cross arms and the ram is brought down to the work faster than you can tell about it.

That's why the first hydraulic stroke goes to work right where you want it—No wasted time or energy! Speed for industrial use!



Note teeth are cut into ram. Rack is not separately attached.

K. R. WILSON
27 Lock Street, Buffalo, N. Y., U.S.A.

Export Department
90 West St., New York, N. Y.

West Coast Branch
722 Mateo St., Los Angeles

EXCELSIOR No. 14 ANGLE ROLLING MACHINE

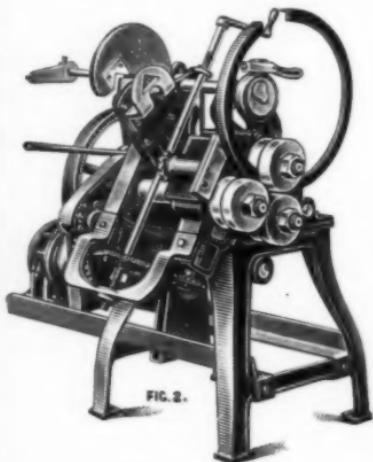


FIG. 2.

Capacity 2x2x1 $\frac{1}{4}$ " Angles. All the rolls are direct driven avoiding slipping of the material between rolls, which are operated by the oversize Excelsior friction clutch. Write for Price and Testimonials.

We specialize in Automatic Grinding and Polishing Machines, to polish Stainless Steel Sheets, Automobile Bumpers, and parts, Stove and Range Top Castings, Electric Iron Sole Plates, etc.

Also Inside Cutting Shears, Deep Throat Power Punches for duplicate work by the use of horse shoe templets up to No. 12 gauge. Used in Stove, Range, Air Conditioning and Kitchen Equipment Plants.

**EXCELSIOR
TOOL & MACHINE CO.**
East St. Louis, Illinois

is of 1/3 h.p. capacity, operating at 1740 r.p.m.

Working surface is 4 $\frac{1}{2}$ " x 18". Longitudinal travel (hand) is 12". Longitudinal travel with Change-O-Matic is 10". Feed range with Change-O-Matic is .162" to 9.125" per minute. Cross travel is 3 $\frac{1}{4}$ " — vertical travel 6".

Twelve spindle speeds are provided between 54 and 3225 r.p.m. Spindle taper is No. 2 Morse. Hole through spindle is 17/32". Spindle is carried on Timken tapered roller bearings. Arbor diameter is $\frac{7}{8}$ and overarm diameter is 1 $\frac{1}{2}$ ".

Engraving and Marking

A De Luxe Handee engraving and marking set is announced by Chicago Wheel & Mfg. Co., 1101 West Monroe St., Chicago.

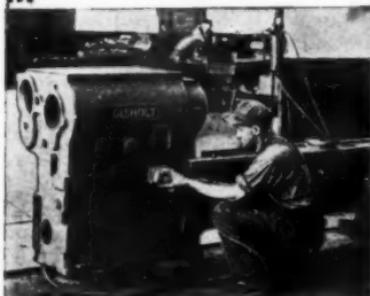


It may be used to engrave or mark practically any material including hardened steel. In fact, it was the Superintendent of a prominent gear manufacturing plant who suggested the development of a special marking set with the DeLuxe Handee as the basic unit.

On the inspection bench or right on the production line, the tool can be used as one would a fountain pen or pencil to write symbols, characters or marks on the hardest steel.

The tool is well balanced and shaped to fit the hand, with all moving parts enclosed, except the accessory being used. The set comes complete with the necessary accessories for marking high and low tensile strength materials.

3 Men's Work for 1 Man's Pay



STERLING SPEED-BLOC SANDER

- Cuts material costs 50%
- Produces better work in $\frac{1}{2}$ the time
- Pays for itself in a short time
- Easy to operate—one hand guides the Sterling.

Sands flat or curved surfaces. Sands filler coats, "feathers" spot jobs, takes off burrs—does almost any kind of sanding and rubbing on any surface—quicker, better and more economically. Can be used for wet or dry sanding.

Ask for Free Demonstration

Sterling
TOOL PRODUCTS COMPANY

357 E. Ohio St. / Chicago, Illinois
615 W. Washington Blvd., Los Angeles, California

Enjoy Easy Temperature Regulation—Low Gas Consumption . . .



*Send for
New Folder
on Industrial
Furnaces*

\$112.00
F. O. B. Cedar Rapids, Ia.

JOHNSON 550 POT-HARDENING AND MELTING FURNACE

SAVES heating a large furnace
for a few small parts

Especially designed for pot hardening and melting non-ferrous metals. Ideal for salt, cyanide and lead hardening, and a money and time saver. Complete with lid, derrick for lifting lid, 8"x10" steel pot and Johnson Blower. Widely used by tool and die makers, model and pattern makers for melting brass, aluminum, and nickel-silver. For a quick, inexpensive job use No. 550.

Available with steel pots in 10"x12" or 14"x20" size at slight additional cost. If larger pot is needed, specify for quotations.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids, Iowa
524 E. Ave., N.W. ESTABLISHED 1901



Model A

Vertical Oscillatory GRINDER

Highly trained workmen are not needed with this modern method of grinding and stoning dies and tools. These modern oscillatory grinders permit production savings up to

80%, with added accuracy, perfectly finished parts, rapid production and the ability to make quick job changes. Can be used on form tools including Tungsten Carbide.

Send for bulletins giving full details.

PETERS TOOL CO., INC.
114 E. SCOTT ST. MILWAUKEE, WIS

OTC GRIPOMATIC PULLERS

For PLANT MAINTENANCE Capacities 5 to 50 TONS

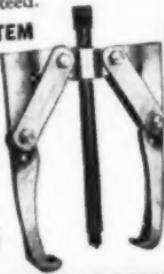
Patented grip prevents slipping, avoids damage, eases work in close quarters. Alloy steel—guaranteed.

OTC PULLING SYSTEM

includes many sizes and types. Pushers and Pullers to install or remove gears, bearings, wheels, pulleys, sleeves, shafts, etc.

Write for catalog.

SPECIAL PULLERS
designed. Ask us about your special tool needs.

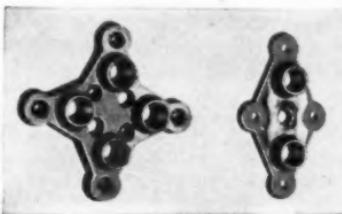


OWATONNA TOOL CO.

355 CEDAR ST. OWATONNA, MINN.

"Ruddy" Rapping Plates and Dowel Pins

Every patternmaker has seen warped rapping plates and their consequences—patterns that wobble on the dowel pins and produce castings overweight or not true to pattern. Designed by a practical pattern man for pattern men, the makers emphasize that Ruddy rapping plates will not warp. Tubular projections near the plate ends provide added strength where it is needed. The plates are easily put on. One bit bores



all the holes for installing any one plate. The routing is all done in straight lines—there are no curves. The snug fit that results from straight line routing prevents wobbling. The tubular projections fit snugly into holes bored in the wood, taking part of the load from the screws, making patterns and plates last longer. Six sizes are available to handle the full range of pattern work.

The dowel pins, shown in the lower half of the illustration are easy to install and stay put. The triangular shape is designed to prevent wobbling and to eliminate the unhandy extension bits

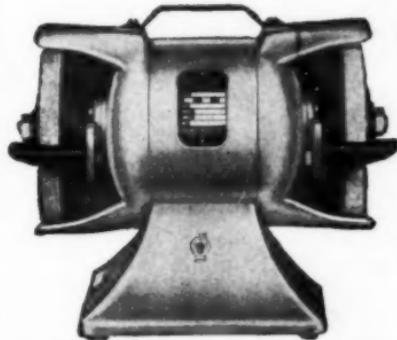
THE SPOTLIGHT IS ON THE
Floating Feature
 EXCLUSIVE WITH ALCO TOOLS



And it stands the spotlight. Here are some advantages: No bushings required; bushing inventories wiped out; no time lost in looking for bushings or waiting for special bushings to be made; no idle machines; no tool room confusion or disorganization on account of special bushing requirements; absolute concentricity, even on old machines with worn bearings; perfect holes, perfect threads, spot inspection only being necessary; reduced unit production cost, resulting from faster set-ups and fewer rejections; bushing headaches forgotten.

Write today for full particulars.

The Alco Tool Co., 835 Housatonic Ave.
 Bridgeport, Conn., U. S. A.



STURDY BUILT for Long, Hard Service

A complete line—
 6" to 12"; Bench and
 Pedestal types;
 heavy - duty;
 ball-bearing;
 Price range
\$19.50 (at left) to
\$186.60 (at right)
 1-YR. GUARANTEE

Write for Bulletin 77

BALDOR ELECTRIC COMPANY
 4368 Duncan Ave., St. Louis Mo.

BALDOR
 BALL BEARING **GRINDERS**



when installing the pins. One bit of the same size as the diameter of the pin does all the boring needed. Male and female halves are of the same size, interchangeable in any position, assuring a smooth, tight fit without binding. The shape of the dowel pin prevents twisting. The malleable knock-down lugs which are tapped over the screw heads, prevent screws from loosening even when the pattern is used continuously on a bumping machine.

SCHAUER Speed Lathes



For
Finishing
Lapping
Polishing
small parts

Production necessities; timesavers. Specially designed to handle finishing operations more speedily and at lower cost.

Write for circular
No. 380.

SCHAUER 2014 Reading Road, Cincinnati, Ohio

BLUE DEVIL

Socket Screws



COLD FORMED

SAFETY SOCKET
4042 N. KIRK AVE.

SCREW CORPORATION
CHICAGO, ILLINOIS

The makers, The Federal Foundry Supply Co., 4602 E. 71st St., Cleveland, Ohio, make a complete line of items for pattern-makers and foundries, fully described in bulletins.

Andrew Vertical Boring Machine

An efficient single spindle vertical boring machine is offered by The M. L. Andrew Co., 321 Colerain Ave., Cincinnati, O.

It features universal table angular adjustment 45° either direction. The table is 28" x 20" and spindle travel is 10". Distance from center of spindle to face of column is 16". Distance from chuck to table at lowest point is 16". Vertical adjustment of table is



16". Floor space occupied is 60" x 20" and net weight is 1100 lbs.

Several options are offered in motor equipment, viz., 1½, 2 or 3 h.p., operating at 1800 or 3600 r.p.m., or a 1000-3600 r.p.m. two speed motor. D.c. motors of the same capacities operate at 1800 r.p.m.

GRINDING WHEEL DRESSERS—VISES

We manufacture the only complete line of Grinding Wheel Dressers and cutters and will gladly suggest the proper one for your wheels.

The exclusive solid steel slide makes Simplex Vises stronger and more serviceable.



Desmond Heavy-Duty Dresser



Simplex Machinists' Vise



Desmond Diamo-Carbo Dresser, best tool room dresser.

Write for catalog H showing complete line of Desmond Dressers and Simplex Vises and name of your nearest dealer.

DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Canadian Desmond-Stephan Mfg. Co., Ltd.—Hamilton, Ont.



W-3B "RACINE" Wet Cut Utility Saw,
6" Capacity.

Available in two types—the Wet Cut Model and the Dry Cut Model—6"x6" Capacity.

Tear out the attached coupon and get our free catalog No. 70A. You will be surprised to learn of the savings to be made using these modern RACINE machines.

The most complete line with

RACINE Heavy Duty Hydraulic Saws 10x10 to 14x20

RACINE "Shear Cut" Screw feed Saws 6x6 to 8x9

RACINE Hydraulic "Oil Cut" 6x6

RACINE Utility Saws 6x6 and Racine Duplex Bandsaws.

"STANDARD THE WORLD OVER"

RACINE TOOL & MACHINE CO.
1754 State St., Racine, Wis.

RACINE

High Speed Metal Cutting Machines HYDRAULIC UTILITY SAWS

Here are moderately priced saws designed to handle your general shop cutting in the most efficient and fastest manner. These Utility saws contain those advantages of Hydraulic feed and control formerly found only in expensive production machine tools.

Hydraulic operation reduces moving parts to a minimum—No friction drives, ratchets, or screws to wear or cause horse power loss. RACINE Utility saws prolong blade life because of their smooth oil-cushioned operation. Their sturdy, rugged construction gives you the fastest, most accurate cutting with the least cost.

Please send me catalog No. 70A on RACINE Utility Saws. Also general catalog on complete line.

Name

Company

Street

City, State

"Ace" Bench Grinders

A new Ace line of improved electric bench grinders has been developed by the Arm glo Co., Milwaukee, Wis.

Capacitor single phase start-and-run motors are used, with double pole start and stop switches handily mounted in the base. Life time grease-sealed ball bearings are another attractive feature. Safety glass shields are available for a slight extra charge.

The 1/3 h.p. model is shown. It oper-



SAVE DIE COSTS on Many Small Runs

Duplicate many varieties of metal pieces and save die expense with the

MICRO DIE DUPLICATING BENDER

Bends angles, channels, rods, tubes, wire, strip stock, etc. Quickly set up. Accurate to .001". Write for circular "Metal Duplicating without Dies."

O'NEIL-IRWIN MFG. CO.

314 8th Ave. So., Minneapolis, Minn.



BURR KEYSEATERS



Mill keyways in the run or on the ends of shafting already erected—save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N.Y.

ates at 3450 r.p.m. Length of the $\frac{1}{2}$ " spindle is 15". 6" x $\frac{3}{4}$ " x $\frac{1}{2}$ " wheels are used. Weight is given as 53 lbs.

Kennametal Price List

A 16-page price list (No. 5), containing new low prices on 20 standard Kennametal-tipped tools, five styles of Kennametal blanks, nine semi-standard tools, two milling cutters, and three lathe and grinder centers, has just been issued by McKenna Metals Co. 135 Lloyd Ave., Latrobe, Pa. The new Price List also contains prices for blank weights from 1 to 1,000 grams of Kennametal.

Drawings illustrating 20 standard Kennametal tools are shown on the front cover, on which tool savings up to 60% are made possible by the new low prices.

Price List No. 5, which has been printed on yellow paper for easy identification, supersedes all previous price lists as of October 1, 1940. Copies will be sent free upon request.



CLOSED

TRADE



CLOSED

MARK



Offset Type

OPEN

CONTINUOUS HINGES

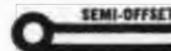
All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET.

**AUTO MOULDING
& MFG. CO.**

2326 S. CANAL ST
CHICAGO

SPECIFICATIONS:
Open Width $\frac{1}{2}$ " to 6"
Gage Material .040 to .125
Pin Diameter .101 to $\frac{3}{8}$ "
Lengths to 120"



Will Manufacture Liberty Planers

The Liberty Planer & Mfg. Co., has been formed to succeed the Liberty Machine Tool Co. in the manufacture of Liberty planers. The new company will manufacture the complete line of Liberty double housing, openside and convertible planers. At present, principal effort is being devoted to a 48" con-

vertible planer which takes 72" between the stationary housing and the movable auxiliary housing. Many of the old Liberty personnel are associated with the new Company, of which Harry A. Dingeldein is President, H. R. Ryan Vice-Pres. and L. G. L. Thomas, Sec'y-Treasurer. The new concern is located in the plant which was the home of Liberty Planers for so many years at 1000 Weller Ave., Hamilton, Ohio.

MARKED - IDENTIFIED

Permanently



MODEL 25

PART NUMBERS,
HEAT NUMBERS,
CATALOG NUMBERS,
SERIAL NUMBERS,
PATENT NUMBERS
MANUFACTURER-INSTRUCTION DATA-INSPECTION

Positive, Permanent MARKING ON YOUR PRODUCTS ASSIST PROSPECTS TO ORDER. MAKES IT EASIER TO BUY—NEW, REPEATS AND REPAIRS. GIVES YOU A DEFINITE RECORD OF PERTINENT DATA ON EACH PART PRODUCED.

The Pneumatic Marking Machine ILLUSTRATED IS OUR HI-DUTY MODEL 25 GENERAL PURPOSE TOOL FOR SHORT RUNS OR PRODUCTION WORK. IT OPERATES FROM YOUR SHOP AIR LINE AND IS ONE OF NUMEROUS MODELS BUILT TO PRODUCE NEAT, PERMANENT MARKINGS QUICKLY ON METAL FABRICATIONS.

WE WILL BE HAPPY TO MAKE SPECIFIC RECOMMENDATIONS UPON RECEIPT OF SAMPLES OR PRINTS OF PARTS TO BE MARKED, SHOWING APPROXIMATE LETTERING, ITS LOCATION ON THE PART, WITH REQUIRED HOURLY PRODUCTION.

**MARKED PARTS ADVERTISE
IN THE RIGHT PLACE, AT THE RIGHT TIME.**

*Unlike John Alden —
"They Speak For Themselves."*

GEO. T. SCHMIDT, Inc.

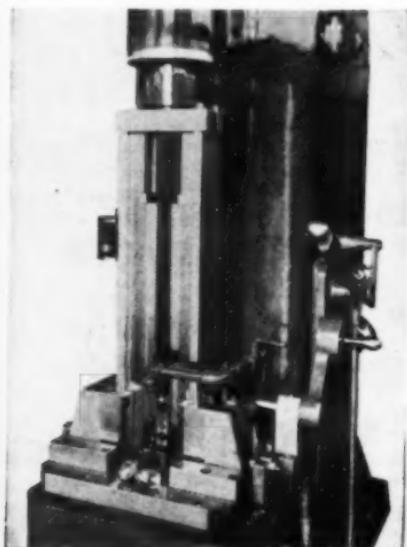
1802 Belle Plaine Ave., Chicago, Ill.
Builders of Marking Equipment Since 1895.

Send for complete catalog of our full line of marking Tools, Machinery and Equipment.

Broaching "Hex" Flats

HERE is a unique broaching operation preformed on an American Broach & Machine Co.'s (Ann Arbor, Mich.) hydraulic broaching press with special clamp-down latch for holding the work while surface broaching two flats of a hexagon aluminum plug.

The machine is the standard American V-2 6-ton press, having both manual and foot control and commonly used for push broaching and pressing operations. However, the machine is shown arranged for surface broaching, by providing a fixture for guiding the hardened broach holder, which in turn receives the broaches.



This fixture is also arranged with an accessible loading provision in the front, with quick clamping means for locking work in position. A summary gives further information:

Fixture is arranged with laterally adjustable hardened and ground guides for broach holders, to permit broaching of hexagons of various widths across flats. One stationary lower locating block and one upper movable clamping block are provided for each part to be broached. Both blocks are reversible, one side of each being arranged with a symmetrical vee for the first and third passes, and the other with an unsymmetrical vee for the second pass, where one face of the vee receives the original round surface. Both faces of the symmetrical vee receive round surfaces in the first pass, and previously broached flats in the third pass.

Broach Holders are of hardened and ground steel and are guided in the fixture.

Connecting Head is provided to adapt the broach holders to the machine ram. Adjustment is provided for different size hexagons.

Broaches are arranged with shear angle to insure smooth cutting.

Cycle—(1) Operator loads one piece into fixture and depresses pedal or hand lever to bring ram down to broach the piece. (2) At the bottom of the stroke, operator releases machine control and special latch prevents returning of ram. (3) Operator unloads broached piece and trips machine latch to permit ram to return to "up" position.

The first two sides of the hexagon

of a bank of pieces are first broached. Then the locating and clamp blocks are reversed and the second pair of sides are broached. Finally the blocks are returned to their original position and the last pair of sides are broached to complete the hexagon.

Material—Brass, steel, and aluminum alloy. **Stock**—.156" maximum per side. **Length of cut** 1-1/8" maximum. **Stroke**—20". **Loading time**—6.0. **Width of cut**

—1-3/8" maximum. Hexagon 5/16" to 1-13/16" across flats. **Machine cycle**—6.0. **Total cycle**—12.0.

Production—300 pairs of sides per hour at 100% efficiency or 255 pairs at 85% efficiency. Production in completed parts (not including time required for tooling set-up) 100 complete pieces per hour at 100% efficiency or 85 complete pieces per hour at 85% efficiency.

Don't Tie Up Big Presses with Small Jobs!

ROUSSELLE PUNCH PRESSES

will handle small jobs quickly and efficiently, leaving the large presses free for those big jobs. Every safety feature of the large press has been incorporated in this Rousselle model. Features like Safety Automatic Knock-out Bar and Non-repeating Clutch. Don't waste time and money operating large presses.

Rousselle also has the punch and stamina of a large press, being able to turn out 10,000 operations per hour.

With this small Rousselle Punch Press you will be able to do away with High first cost, High production cost, High power costs, Wasted floor space and inefficiency.

Write today and learn how you can save on operating costs.



DAVID J. ROSS COMPANY
BENTON HARBOR, **MICHIGAN**

ECONOMICAL BENCH FURNACE

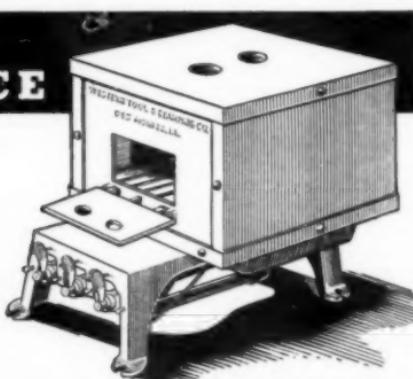
NO BLOWERS OR AIR PRESSURE REQUIRED

Fast, Even, Indirect Heat

A compact solidly built and efficient hardening and tempering furnace. Cast iron body with light weight, high refractory lining and cast ni-chrome grate. Pyrometer opening in rear wall. Three burners equipped with pilot lights. Rise in furnace temperature approximately 100 degrees per minute.

Depth Size of Opening Shipping Weight
7" 2 $\frac{3}{4}$ "x5" 85 lbs.

Specify whether mixed or natural gas is used.
Price, \$55.



WESTERN TOOL & STAMPING CO. DES MOINES, IOWA

**LET US QUOTE
DIES AND METAL STAMPINGS**
WESTERN TOOL & STAMPING CO.
Des Moines, Iowa

**IOWA DISTRIBUTORS
FOR MARSHALLTOWN LINE OF PRESSES**
WESTERN TOOL & STAMPING CO.
Des Moines, Iowa



"Logan" Air-Draulic Cylinders

Logansport Machine, Inc., Logansport, Ind., recently announced a new



line of Air-Draulic cylinders. As the name implies, this new line of cylinders uses a combination of air and hydraulic pressure for power. The prin-

ciple is said to be revolutionary and a great improvement in the cylinder field.

The new cylinders were developed to provide an air operated cylinder with the smooth, steady action of a hydraulic cylinder. With this combination of air and hydraulic action, the piston can be controlled accurately at all speeds up to the maximum, adapting the new cylinder particularly for operating milling machine tables, drill spindles, sliding tables and other tools.

The cylinders provide the following cycles:—(1) Feed out—Rapid return. (2) Rapid traverse out and feed—Rapid reverse. (3) Feed in—Rapid traverse out. (4) Rapid traverse in and feed—Rapid traverse. (5) Feed in both directions.

In addition to this new cylinder line, a complete line of air and hydraulic devices, chucks, cylinders, valves, presses and accessories is presented in Bulletin 270A.

★ FOR TOP VALUE!

MARSHALLTOWN PRESSES

BETTER PRODUCTION



LONGER LIFE



THE MOST FOR YOUR
MONEY!

Marshalltown Presses are engineered and built to give the utmost in dependable, trouble-free service. Features of design include more die space, chrome nickel cranks, wrist pin connections and many other proven advantages. Available in capacity of 5 to 70 tons—each one an outstanding value.

Write today for literature about Marshalltown Presses—available in capacities from 5 to 70 tons.

*Write today for literature
about Marshalltown
Presses.— available in
capacities from 5 to 70
tons.*



NO. 5 FLYWHEEL TYPE

MARSHALLTOWN MFG. CO.
900 E. NEVADA ST., MARSHALLTOWN, IOWA

CHICAGO



STEP PULLEYS



SINGLE GROOVED PULLEYS



MULTIPLE DRIVE PULLEYS



VARIABLE PITCH PULLEYS



FLEXIBLE COUPLINGS



HAND WHEELS



SELF ALIGNING SHAFT SUPPORTS

Manufactured By

CHICAGO DIE CASTING MFG. CO.
2513 W. MONROE ST., CHICAGO, ILL.

New York Office

PATRON TRANSMISSION CO.
150 GRAND ST., N.Y.—N.Y.

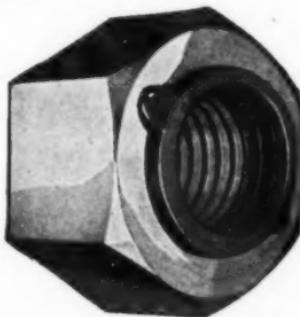
Minneapolis Office

H. A. HOLDEN CO.
300 4th AVE., So. Minneapolis, Minn.
CATALOG ON REQUEST

"Security" Nut with New Locking Principle

Here's a locking nut which the makers say can be tightened up or backed off part way, years after its application, and still retain its grip on the bolt. It can be taken off and reapplied many times without losing its gripping power.

The bolt gripping element of the Security nut consists of a slightly elliptical shaped spring-steel retainer permanently seated in the head of a standard nut.



When the nut is applied, the retainer is distorted from elliptical into a circular shape, thus setting up a powerful spring pressure between the bolt threads and the retainer threads. Neither the threads of the bolt nor of the retainer are injured when applying or removing. It fully meets thread-pitch tolerances of the National Screw Thread Commission.

The Security nut is made by Security Metal Products, Inc., 310 East Kalamazoo Ave., Kalamazoo, Mich.

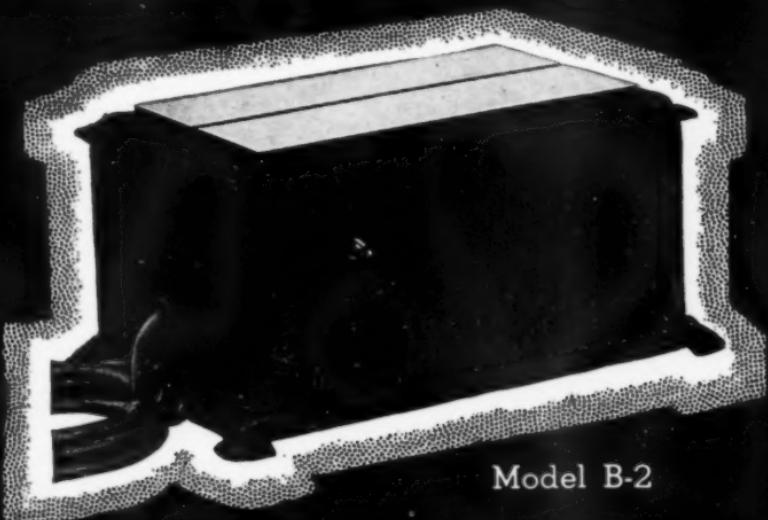
V-Belt Data Book

With every page packed with data, The B. F. Goodrich Co., Akron, Ohio, has just published a new 170 page "V-Belt Data Book," which is available upon request.

The book gives alphabetical listings of belt requirements for many different V-Belt applications. These listings give the manufacturer's part number, the Goodrich belt number and its size in each case, and occupy 118 pages.

L-W DEMAGNETIZERS

Engineered for quick removal of magnetism from work.
Model B-2 is for large jobs and Model J-1 for small work.
A single pass over the stationary poles demagnetizes the
work completely.



Model B-2

Model B-2 working surface $7\frac{3}{4}''$
 $\times 12'' \times 6\frac{3}{4}''$ **\$55.00**

Model J-1 working surface $7\frac{1}{4}''$
 $\times 7\frac{1}{4}'' \times 6\frac{3}{4}''$ **\$37.50**

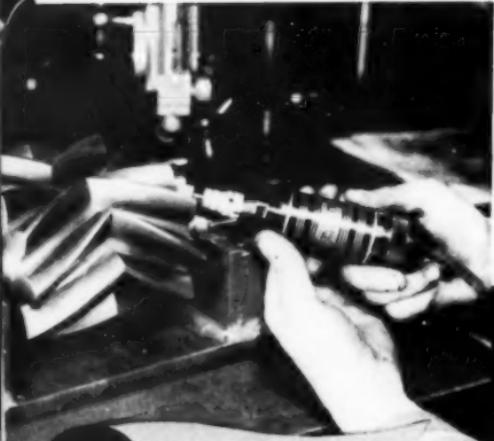
Also Mfr's of
DIVIDING HEADS
LATHE CHUCKS
POWER HACK SAWS
MAGNETIC CHUCKS
MILLING MACHINE
VISES

Both Demagnetizers equipped
with pilot light signal controls.
Operates on 110 volt AC current.

L-W CHUCK CO.
1-7 N. ST. CLAIR ST.,

TOLEDO, OHIO

3

**1**

HANDEE

Tool of 1001 uses

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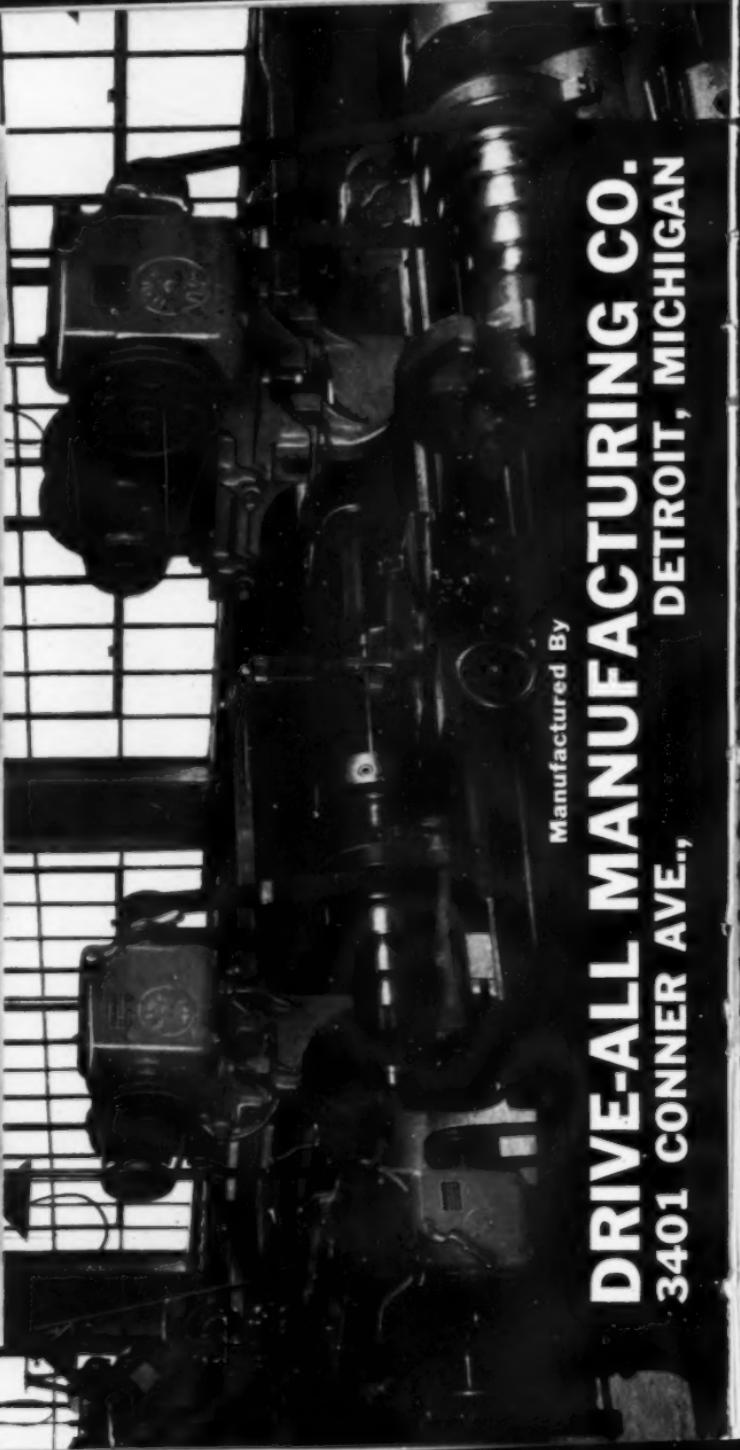
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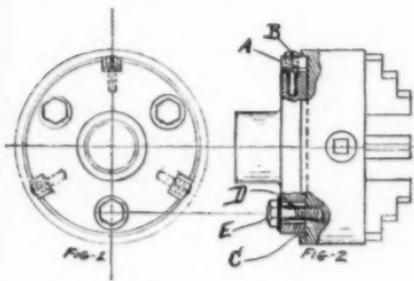
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DETROIT, MICHIGAN

Shop Notes

Converting Scroll Chuck Into Independent Chuck

By R. B. Ware

An ordinary scroll chuck can be converted into an independent chuck readily—or perhaps we should call it a combination chuck.



After they have been used for some time, these chucks may not hold all diameters true.

The universal practice is to have the face plate which screws on to the lathe spindle, fit close in the recess in the back of the chuck. Now it is a simple job to take the chuck off and trim off the face plate diameter so there is clearance as shown at "C" in the sketch. Also drill out the bolt holes as shown at "D."

Then, when you put a piece in the chuck and it runs "out," just loosen the bolts a little and with a lead hammer, knock the body of the chuck a little and you can make your work piece run perfectly true.

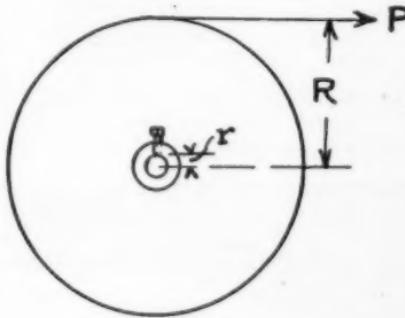
If you want to do a little more elaborate job, put in the adjusting screws as shown at "B," which pull the nut "A" against the recess instead of hitting it with the lead hammer. I have changed several chucks this way in the shop where I have been a toolmaker for several years—also the chuck in my home shop and am sorry I didn't think of this 25 years ago.

Why Set Screws Slip

By W. F. Schaphorst

After a set screw slips, no amount of tightening will prevent slip if the set screw is too small. A slipping set screw is either too small or it is not tightened sufficiently.

Set screws are commonly called upon to pull entirely too much. It is amazing what is expected of them. When you consider that belt pull P as shown in the accompanying sketch is usually



in the hundreds of pounds and often in the thousands of pounds, and when you realize the great leverage generally exerted on the set screw, the wonder is that set screws do not slip more frequently.

To compute the force that a set screw must resist:

- (1) Multiply the horse-power by the radius R in inches and then multiply by 33,000.
- (2) If it is a belt drive, multiply the velocity of the belt in feet per minute by the radius r in inches.
- (3) Divide (1) by (2) and you have the force in pounds that the set screw must resist.

If it is a gear or chain transmission the same rule applies. The principal

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factors that need be known are, as enumerated above, the horse-power; the velocity of the belt, chain, or pitch circle of the gear; the radius R; and the radius of the shaft, r.

After knowing the force that the set screw must resist, the following rule can be used in determining if the screw is large enough: — Extract the square root of the force in pounds and divide by 40. The result is the diameter of set screw in inches.

Or, if you want greater refinement use this table:

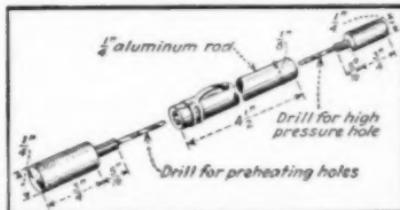
d (in.) equals	1/4	5/16	3/8	7/16	1/2	9/16
P (lb.) equals	100	168	236	366	500	658
	5/8	3/4	7/8	1	1 1/8	1 1/4
	840	1280	1830	2500	3288	4198

For example if you get 2400 lb., as the answer, a 1" set screw will be required according to the table. Or, two set screws, each 3/4" in diameter. The rule gives a set screw 1 1/4" in diameter.

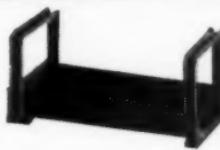
Handy Holder for Cutting Torch Drills

By Arthur Havens

Very often the cutting torch operator has to run back to his tool box or cupboard and get his drills for cleaning out the cutting torch. Then when he brings them to the job he generally misplaces them. A welding supervisor, realizing the extra expense incurred by this habit, developed a way to prevent it, and here's how:



Using a piece of 1/4" aluminum welding rod 4 1/2" long as the body, he made a pencil-like arrangement, drilling a 1/8" hole in each end, deep enough to accommodate the length of the drills. Each end was tapped 3/16". He then



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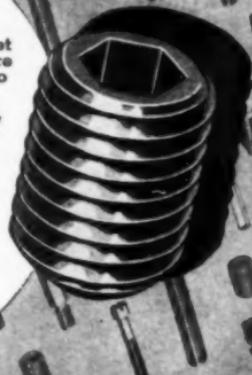
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What is the Belt Tension?

By W. F. Schaphorst

Here is a handy rule for determining the tension in a belt that is slack enough so that the sag can be measured. The tension can be computed easily—without the necessity of expensive or complicated apparatus. For leather belts proceed as follows:

Multiply the width of the belt in inches by its thickness in inches; then multiply by .043; and we will call the answer "P." Now multiply "P" by the sag of the belt in feet; and we will call the answer "A."

Next, multiply "P" by the distance between pulleys in feet; multiply that again by the distance between pulleys in feet; multiply by 0.125; and divide by the sag of the belt in feet; and we will call the answer "B."

Lastly, add "A" and "B" and the result is the exact total tension in the belt in pounds.

No matter what the sag is if it is only a half of an inch or any sag within reason, the above rule will figure it out. It may sound cumbersome, but after once getting started it is easy.

For example, let us take a case where the distance between pulleys is 20 ft.; the sag is 6"; or equal to 0.5 ft.; the belt is 6" wide and $\frac{1}{4}$ " thick. What is the total tension?

Applying the above method we get:
 P equals $6 \times \frac{1}{4} \times 0.43$ equals 0.645
 A equals 0.645×0.5 equals 0.322
 B equals $0.645 \times 20 \times 0.125$ equals 64.5

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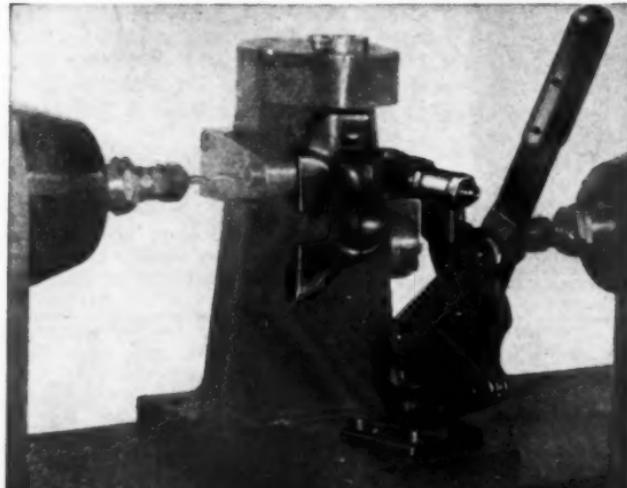
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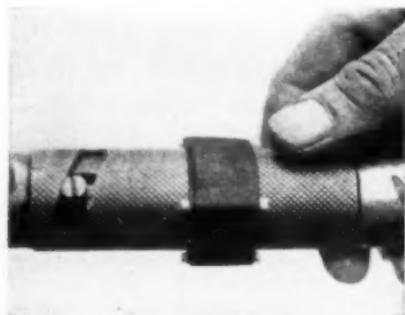
0.322 plus 64.5 equals 64.82 pounds equals total tension.

"Non-Slip" Grip for Throttle Sleeve

By Frank Bentley

The knurled throttle sleeve on many pneumatic motors, drills, and other compressed air driven tools is often hard to keep regulated and operate with the precision needed on many jobs. If the hands are moist with oil or in colder weather, covered with heavy gloves, the throttle sleeves are not

easy to hold, particularly if the knurling is a bit worn and smooth. Take some electricians' insulating tape and with several matches apply the handy emergency aid to the grip as shown. Make one or two turns of the tape around the sleeve. Then lay in three or four pieces of match or other small slivers of wood. Wind one or two



turns of the tape quite firmly around them, pressing the tape down to make several ridges or humps. These are comfortable on the fingers, yet afford an excellent controlling grip on the sleeve, even with heavy mittens. Not tiresome if the throttle is held for long periods of time. This emergency grip is quickly applied and removed when through using the tool.

Horses — Horses — Horses

By Arthur Havens

Essential parts of the extra equipment in a machine shop are suitable horses to hold the work. Here are some sketches of simple ones that are



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exceptionally sturdy and easy to construct. The low heavy duty horse needs little explaining. It is made from a scrap piece of .80 lb., rail 6 ft., long with two legs welded as shown.

The high heavy duty horse uses for the top, a piece of regulation 10" channel iron 3 ft., long. The legs or standards in this instance are practically the same as in the low horse, only higher and made from $\frac{5}{8}$ " by 3" instead of $\frac{3}{4}$ ".

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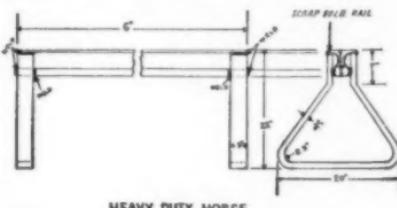
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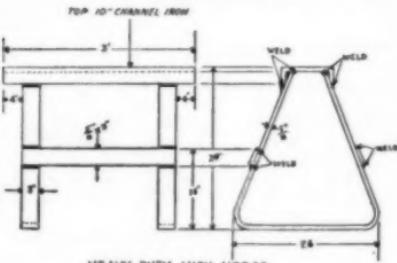
by 3". Both of these horses are made in pairs and can be used for almost any type of work regardless of its weight.

A third type or adjustable horse requires more explanation. It will be



HEAVY DUTY HORSE

found extremely handy as an accessory to the drill press, slotter or in fact anywhere where it is necessary to work on long parts that extend away from the bench or machine. Usually in an adjustable horse, the top part is held in position with pins and it is more or less of a bother to raise or lower it to the required height. With the horse



HEAVY DUTY HIGH HORSE

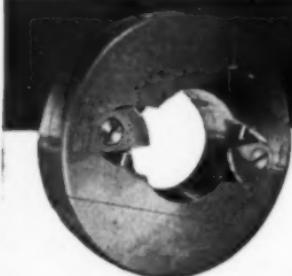
pictured, this trouble is eliminated for it uses a screw and pressure plate feature. One inch down from the top of the legs, remove a section of the pipe

for
your
lathes

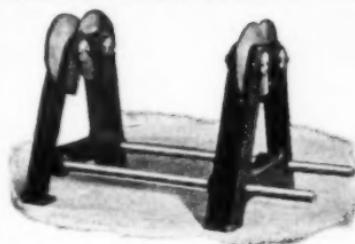
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about $1\frac{1}{2}$ " square. To this, weld another piece 1" square with a $\frac{3}{8}$ " slot in it $\frac{1}{2}$ " long. When welding this, place a $\frac{1}{4}$ " strip under each edge to hold the slotted part away from the pressure

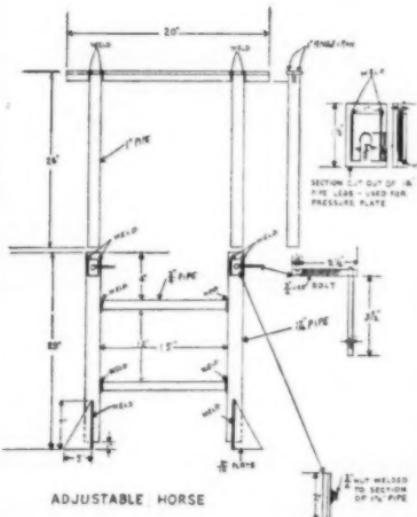


plate. This is for clearance for the end of the screw. A section of $1\frac{1}{2}$ " pipe is needed. It should be 2" long and wide enough to weld over the hole we have cut in the leg. In the center of this, drill a $13/16$ " hole and over the hole weld a $\frac{3}{4}$ " U. S. S. nut. The next requirement is a $\frac{3}{4}$ " bolt $2\frac{3}{4}$ " long. Remove the head from the bolt and drill for a $\frac{1}{2}$ " rod or handle. On the other end of the bolt, turn a groove leaving a $\frac{1}{4}$ " boss on the end of the bolt. Place the pressure plate back in the pipe from where it was removed; screw the bolt through the $\frac{3}{4}$ " nut; put the end of the bolt in the slot arranged for it and weld the outside piece to the $1\frac{1}{4}$ " pipe leg. Then, when the top is lowered into position, a half turn on the screw tightens the pressure plate against the 1" pipe inside of the $1\frac{1}{4}$ " pipe, thereby making a nearly solid horse, yet with a half turn on the screws, the top raises or lowers with ease. The sketch shows



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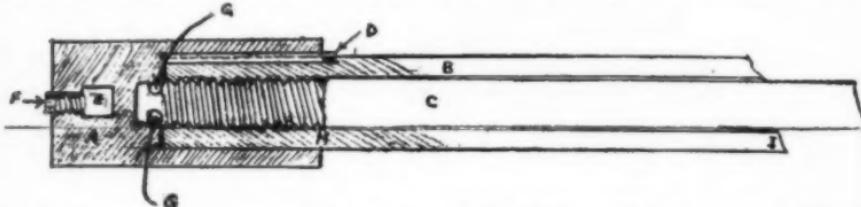
DETROIT, MICH.

$3/16"$ boiler plate for the bottom of the legs. This is not essential. Anything the builder may have will work equally well as this is only to hold the horse in an upright position.

A Handy Taper Tool

John H. Soller

The illustration shows a handy tool for cutting tapers on lathes not equipped with a compound. Although



most lathes today have compounds, this tool has its advantages on jobs where more than one taper is to be cut, making it unnecessary to change the compound setting every time another taper is to be cut.

The sketch dimensions given were made to fit an Armstrong No. 10 boring tool-holder, but can be made in various sizes to fit any other popular holder.

It can be used on metal or wood turning lathes for either tapers, inside boring or external turning.

Section A is keyed to a sliding fit on B housing and can be worked forward or backward by turning spindle C. The operation can be worked by hand or ratchet.

G represents two pin holes drilled through A, aligned to meet groove in spindle C at right-angles, holding A to C, but allowing spindle end to revolve in sleeve A. Section B is tapped on left to take spindle C thread, and bored to a free hole from H to I, to ease the revolving of spindle C.

Slot E is made to hold $\frac{1}{4}$ " tool bits and fastened by set or cup screw F.

Section A is about $1\frac{1}{4}$ " in diameter. Section B about $15/16$ " and length of tool overall, one foot.

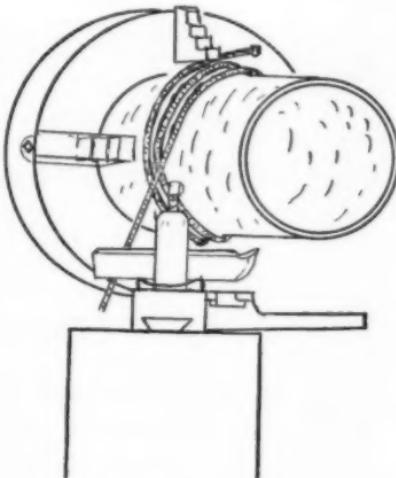
Winding Pipe Coils

By George Blum

The winding of pipe coils in an or-

dinary lathe may be accomplished as shown in the diagram. First choose a mandrel, preferably a short section of large diameter pipe, about an inch smaller than the desired internal size of the coil. True in lathe, then back off one jaw of the chuck and clamp one end of the pipe to be wound under it. The pipe to be wound should be first filled with sand, and capped at each end. This prevents flattening of the pipe or bursting at the

seam. Lathe must be run at lowest speed possible. For lighter pipe sizes, it may be run backward, as shown, and the tool post used to hold pipe



in alignment. For larger size pipe, the lathe should be run forward and the pipe cushioned over the track with a wooden block. Never allow the end of the pipe to pass the bar holding it in place, as there is a great deal of tension upon it.

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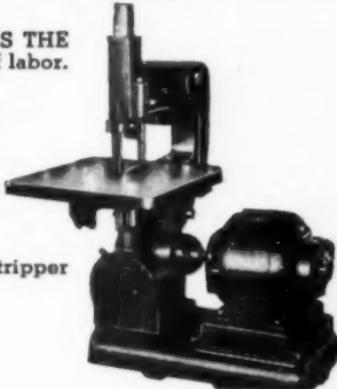
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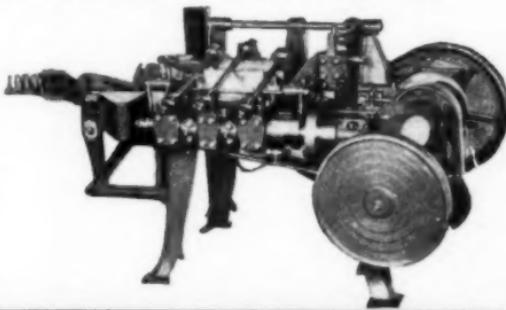
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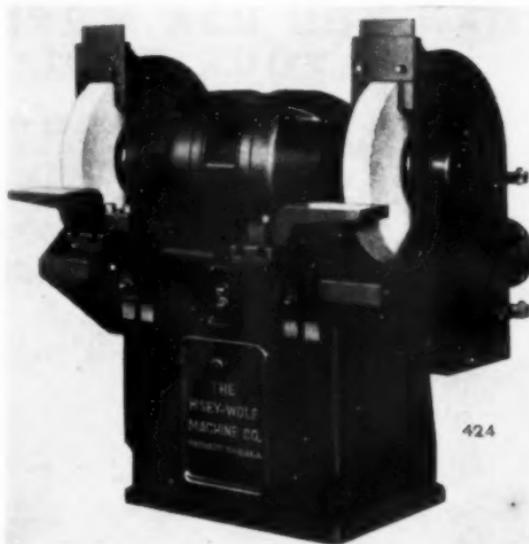


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Hisey-Wolf Offers New Grinders

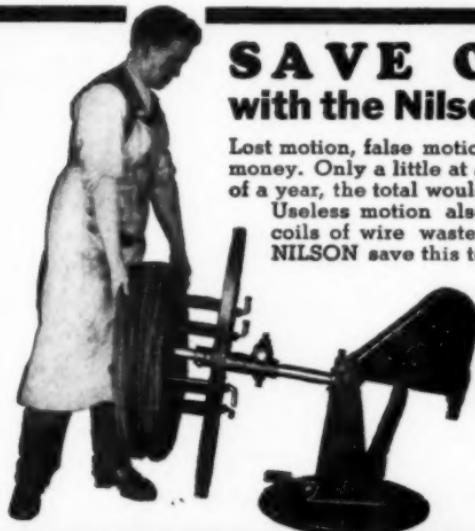
The Hisey-Wolf Machine Co., Cincinnati, Ohio, recently finished the first lot of new design 5 and 7-1/2 h. p. pedestal type grinders. These machines are built in 18" and 20" wheel sizes. The motors are totally enclosed and ventilated through the large pedestal. A continuous circulation of air passes through the motor and out of one motor foot into the pedestal and then into the other motor foot and through the motor again.

The machines can be supplied with new guards which are in accordance with the standards adopted by the American Foundrymen's Ass'n. A closeup of the guard is also shown. It is claimed to be impossible for a piece of work to jam between wheel and guard. The guard extends



424

far beyond the periphery of the wheel so that all sparks and chips are ar-



SAVE ON LIFTING with the Nilson Tilting Wire Reel

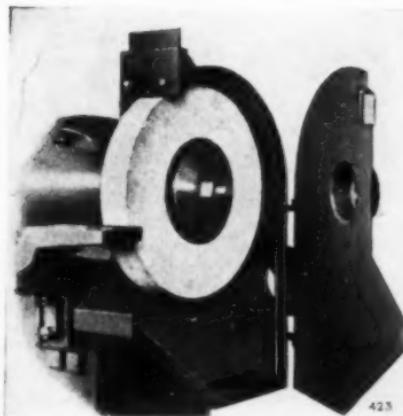
Lost motion, false motion and unnecessary motion all cost money. Only a little at a time perhaps, but over the period of a year, the total would be impressive. Why not save this?

Useless motion also represents a loss. Lifting heavy coils of wire wastes time and energy. Why not let NILSON save this too?

A foot lever is tripped, the guards removed, a coil of wire slid upon the carrier, the guards replaced and set screws tightened, an easy lift, and the counter-balancing weight does the rest, bringing the tilting section to a vertical position, ready to feed the wire into the machine.

Send today for Bulletin No. 51 and learn how you save in other ways too.

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.



rested. The flange on outlet makes an easy connection to the dust collecting system.

Toolmakers Wanted

To meet the heavy demand for toolmakers for the National Defense Program, the United States Civil Service Commission urges qualified persons to

apply for this work. Applications will be rated as received at the Commission's Washington office until further notice. Immediate appointments are to be made at ordnance and naval establishments in Philadelphia, Pa.; Boston, Springfield, and Watertown, Mass.; Watervliet, N. Y.; and Washington, D. C. Approximately 600 appointments will be made in the Frankford Arsenal alone. The pay scales vary according to the place of employment, ranging from \$6.24 a day to \$1.17 an hour.

Applicants must have completed a 4-year apprenticeship as toolmaker, or must have had 4 years of practical experience in the trade. They must be able to read blueprints and must be experienced in the use of precision gages, measuring instruments, etc.

Further information as to the requirements for this position and application forms may be obtained from the Secretary of the Board of U. S. Civil Service Examiners at any first-or second-class post office, or from the U. S. Civil Service Commission, Washington, D. C.

**Take this tool
to the Work
ANYWHERE**

Do Grinding
Sanding
Wire Brushing
Drilling
Polishing
the Quick
Way



with New

STOW

Flexible Shaft Machine

On many maintenance and production jobs, you can save time, ease the work and cut costs by using this handy truck-mounted STOW model—any place in your plant or yard. It's a glutton for work — because STOW's 65 years experience with flexible shafting guarantees unusual ruggedness and power capacity. Here's an all-around machine that can pinch-hit or do steady-duty with equal reliability. It will be a maximum earner for you—one you can't afford to be without in these days when every job is RUSH.

There are many other types of STOW machines. Write for catalog; helps you determine speeds, power ratings, mountings, etc., for your purpose.

STOW Manufacturing Co., Inc.
30 Shear St., Binghamton, N. Y.

Established 1875
Inventors of Flexible Shafts

Portable Compressors

An unusually attractive new 28-page catalog has been issued by Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y., presenting their streamlined two-stage air-cooled portable



compressors, four models of which are illustrated, giving a hint of the variety of sizes and mountings available.

A unit that is particularly attractive is the new 500 cu. ft. model which is Diesel driven, offering real economy in operation. With fuel oil at six cents per gallon, it is asserted that this model will operate at full capacity with 100 lbs. discharge pressure at a fuel cost of only 41½ cents per hour.

The compressor is a true V-8, having two low and two high pressure cylinders on each side with an included angle of 90°. One low and one high pressure connecting rod operate on each

THE REID POWER-FEED SURFACE GRINDER INCORPORATES SEVERAL EXCLUSIVE FEATURES,

Including:

1. Centralized Control.
2. Convenient Cross Feed Knock-Off.
3. Rapid Table Travel With Chain Drive.
4. Complete Dust Protection.
5. Improved Spindle Assembly.
6. Hydraulic Controlled Reverse Clutch.

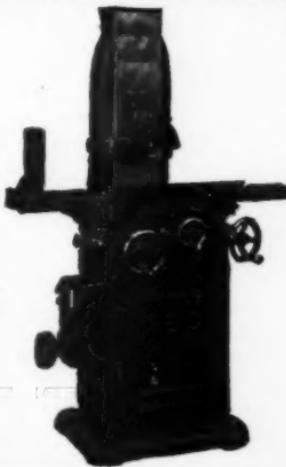
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REID BROTHERS COMPANY, INC.

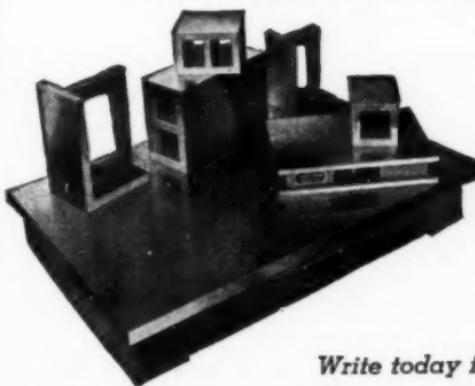
EST. 1900

Beverly

Massachusetts



A Necessity for the Modern Tool Room and Inspection Departments



Milwaukee Surface Plates, Angles, and Parallels are indispensable in this day of modern production where accuracy is required.

Write today for full information

J. C. BUSCH COMPANY

165 South Barclay St.,

ENGINEERS AND MACHINISTS

SINCE 1907

MILWAUKEE, WIS.

of the four crank pins. It can be skid mounted or mounted on steel or pneumatic tires.

The catalog gives sectional and cut-away views of engines and compressors and presents a wealth of useful and interesting information.

Aircraft Alloy Steels

The Jessop Steel Co., 603 Green St., Washington, Pa., announces that its direction of special alloy steels for

the aircraft industry has now been extended to include heat-treated and cold-drawn annealed bar products. The manufacture of Jessop aircraft steels was formerly confined to sheets and plates.



KUTMORE HIGH SPEED

Adjustable Hollow
Mills with
Toway Micrometer Adjustment
Cutting capacities
up to $2\frac{1}{2}$ ".



Ask for New Catalog

Reisinger Mfg. Company
837 Lake Ave., Rochester, N. Y.

ACROMARK TRADEMARK

NAME-PLATE
STAMPING
MACHINE

Write for latest catalog.

H. O. BATES

258 North Broad St.

Elizabeth, N. J.

STYLE
No. 1
\$95.00
F.O.B.
ELIZ. N. J.

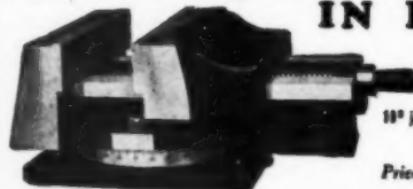
DIES
CAN BE
REPLACED.



SAE Steels of the various alloy series, such as 2300, X4130, 4340, etc., are now supplied in bar form to meet the physical requirements for such parts as bolts, U bolts, studs and other stress parts. The illustration shows a de-icer slinger ring bracket fabricated from Jessop aircraft steel and sold through Air Associates, Inc., Bendix, N. J. The main part is fabricated from sheet stock while the hook in the center was made from bar stock.

Jessop aircraft steels are now available in the principal analyses required by the industry. All such steels are melted in electric furnaces, rolled to close tolerances, and magnaflux tested to meet the requirements of government specifications for aircraft industry.

SUPERIOR QUALITY AND WORKMANSHIP IN PLUNKET VISES



SQUARE BASE SHAPER VISE

100° jaws, $2\frac{1}{4}$ " deep, opens $8\frac{1}{2}$ ". Weight 125 lbs. \$46.80

Our complete line includes Vises for Drill Presses, Milling Machines, Shapers and Grinders.

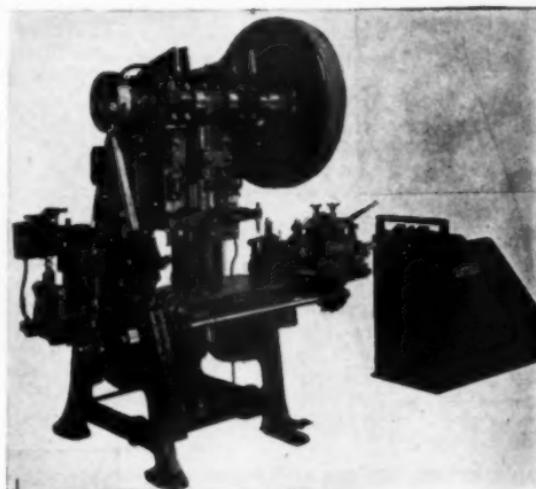
Prices are net, f. o. b. Chicago. Write for illustrated folder today. Dealers wanted in unoccupied territory.

J. E. Plunket Machine Co. 1823 W. Lake Street Chicago Illinois

Scrap Cutter With Intermittent Feature

When scrap is cut to length, especially in longer pieces, it is much easier to bail and handle; and when the unit that cuts the finished product to length can also be used for scrap cutting as well, and do both jobs automatically, it becomes important in economical and efficient production. Such a unit is the new scrap cutter of the intermittent type announced by the F. J. Littell Machine Co., 4153 Ravenswood Ave., Chicago. This scrap cutter is so designed that scrap or finished material can be cut at any predetermined number of strokes of a punch press.

Cutter blades are open when in normal operating position, and are so held by springs on the slide of the scrap cutter which is constantly maintained in its open position. A gag or blocker unit is built into the rear scrap-cutter connection. Gag is connected to and operated by a solenoid switch which, when energized, moves the gag to blocking or cutting position. The solenoid is connected electrically to the controlling unit which consists of a ratchet (which may have any number of teeth), a driving mechanism for operating the ratchet at one or more teeth per stroke of the press, and a switch operated by trip lugs placed at stated points on the ratchet gear.



In operation the trip lugs are placed at points on the ratchet gear, tripping

PYRO



Indispensable in any MODERN non-ferrous foundry. Reduces spoilage and secure UNIFORM SOUND CASTINGS. Patented clamping device stops the pointer at correct indication — a PYRO feature.

Write for our bulletin No. 110.

Pyrometer Instrument Co.
102 Lafayette St. New York

GROBET
ROTARY FILES
ground from the solid



Ask for Catalog WG

the most complete catalog
of its kind, illustrating hun-
dreds of rotary files hand cut,
milled cut, ground from the solid;
also diesinkers' burs.

GROBET FILE CORP. OF AMERICA 3 Park Pl., New York, N.Y.

the switch every so many strokes of the punching press. For example, if it is desired to cut off a strip of metal at every 20 strokes of the press, simply select a 60-tooth ratchet and place three trip lugs at equidistant points on the ratchet gear. This same 60-tooth ratchet will also serve to cut off strip at 60-30-15-12-10-6-5-3 and 2 strokes of the punch press. A 48-tooth ratchet will serve for 48-24-12-9-6 and 4 strokes of the press.

In addition to being able to cut finished work to length, there is a further advantage where such materials as thin brass, copper, aluminum and other non-ferrous metals are being fed by roll feed through punch presses, as it is very desirable to have the scrap cut in long pieces, for such lengths make the scrap easier to bail, and bails of this type hold intact.

Intermittent feature of the scrap cutter described can be added to any Littell scrap cutter now in use, by making a simple change in the slide, together with the addition of a few other parts.



NUMBERALL
Numbering Machines

Automatic and Hand Operated

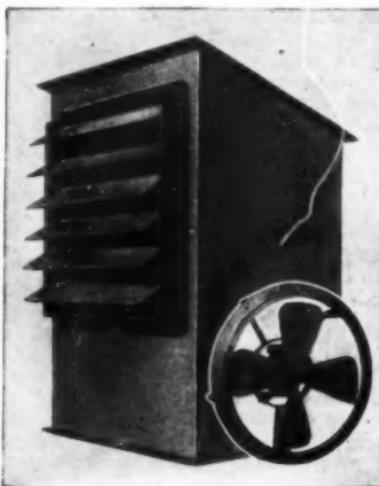
for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.
For Marking Metal Parts, Name Plates, Metal Checks, etc.

Write for Catalog.

NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, Staten Island, N. Y.

Truflow Venting Fans

The Truflow Fan Co., 524 Main St., Harmony, Pa., announces a complete line of Pent House Fans for venting obnoxious gases, fumes and dusts.



The pent house units are of sturdy steel construction and are available in a complete range of sizes for housing standard Truflow wall fans of 12" to 48" diameters. Sheet steel walls and shutters are mounted on heavy angle iron frame. The shutters open and close automatically, and the pent houses are designed to afford greatest possible protection against inclement weather conditions.

**5000 SHAPES AND SIZES
GROBET SWISS FILES**



Ask for Catalog WF.

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog WM on files for filing machines.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

GROBET FILE CORP. OF AMERICA 3 Park Pl., New York, N. Y.

A CLAMP for Every Purpose



Forged Steel
Quick Acting
Deep Reach
Welders



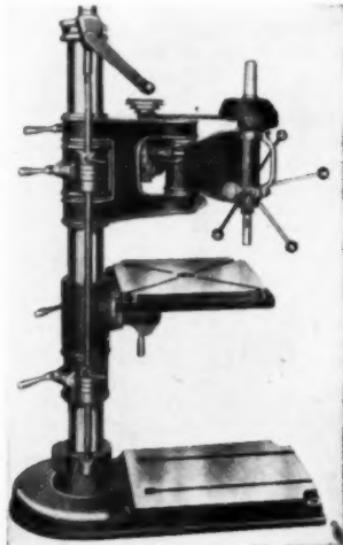
Sizes Available:
 $\frac{3}{4}$ " to 10" opening
 $\frac{1}{2}$ " to 16" deep

Write for CATALOG and PRICES on Clamps for all purposes
as well as many other tools for use in the Machine Shop.

IN STOCK AT YOUR SUPPLY HOUSE

The Cincinnati Tool Co.,

1945 WAVERLY AVE.,
CINCINNATI, OHIO



MAKE YOUR DRILLING JOBS EASIER

Increase Profits . . . Speed-up Production
End Worker Fatigue . . . Increase Efficiency
by using this
DRILLMASTER RADIAL DRILL

Economical in operating and first cost, this floor type, heavy duty, precision-made, well-balanced Radial offers many features that merit your careful consideration. Drilling to the center of a 36" circle, No. 2 Morse Taper and heavy duty $\frac{1}{2}$ HP ball bearing motor. The full floating, ball bearing spindle assures free and sensitive operation at all speeds.

Send TODAY for bulletin giving full details.

Wm. C. Johnson & Sons Machinery Company
St. Louis, Missouri

EVANS High Speed Steel REAMERS



LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

WILL SHIP ON
30 DAYS TRIAL

EVANS FLEXIBLE REAMER CO.

Ravenswood & Wilson Ave.,

WRITE FOR
Chicago, Ill. CIRCULAR

Transparent Floor Finish That Can "Take It"

A noteworthy improvement is said to have been made in Glasflex which has heretofore been known as resistant to minor acids and to heat. Extreme alkalinity and extreme acid conditions, however, did formerly affect it.

It is claimed that this new product has now been improved to the point where a dried film removed from tin and placed in acid and then in alkali in a test tube is not affected even the slightest. In the tests the sample was:

1. Submerged in Concentrated sulphuric acid.
2. Submerged in 50% solution sulphuric acid and water.
3. Submerged in carbolic acid.
4. Submerged in total alkalinity (sodium-hydroxide).
5. A coat of this material after drying but without being removed by baking received a spillage of alcohol. The alcohol was ignited and permitted to burn out completely. Result: Not even the gloss was disturbed.

The illustration shows a film of Glasflex submerged in concentrated sulphuric acid.

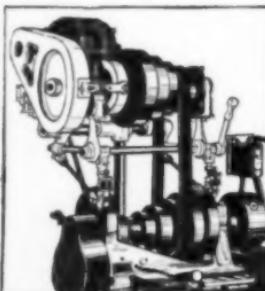


Further information about this material which is adaptable to both wood and concrete floors, table tops, counters, etc., can be obtained by writing to Flexrock Co., 2305 Manning St., Philadelphia, Pa.

Plastic Contactor Shaft

A molded Textolite contactor shaft was selected for a Top Award in the annual competition sponsored by Modern Plastics magazine. The award goes to the General Electric Co.

As the shaft is a part of a contactor

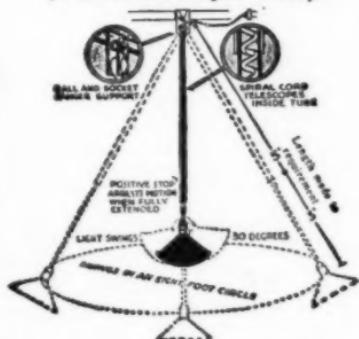


Speed Up! End "Bottle-necks!"

Remco Motor Drives provide the right speed for each job. Make your tools independent of line shaft location and operation. This scientifically engineered Remco Drive takes any motor of reasonable size — new or USED. Motors changed instantly in case of a "burn-out." Folder FREE. Write! Remco Products Corp., State at R.R., York, Pa.

REMCO MOTOR DRIVES
for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

Light—Universal Movable Stays Put best for machine shop and drafting room and avoid glare or head strain.
(Fastened above your work).



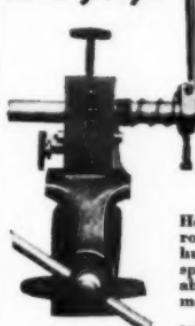
Push it up, pull it down, swing it out, swing it around, it stays put.

Write for Literature.

J. Zabora Machine & Gear Co.
1321 S. Mint Street, Charlotte, N.C.

MAKE SPRINGS

in a jiffy!



**with
Blaner
Universal
Hand
SPRING
WINDER**

Here's a profitable tool room unit. Quickly makes hundreds of sizes of springs. Sturdy, dependable... a real time and money-saver.

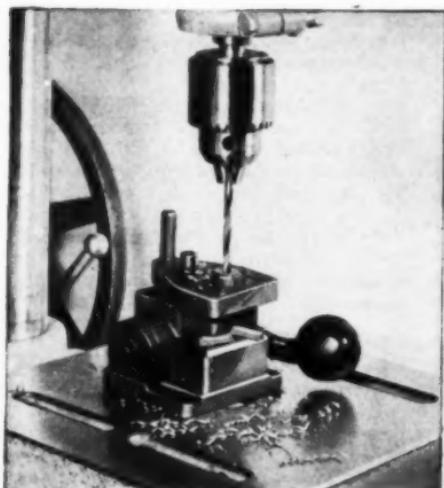
Illustrated is No. 4 Universal with adjusting shaft of $\frac{5}{8}$ " square. Takes wire up to $\frac{1}{4}$ " diam.

Patent No.
2052443

Write for your Circular.

THE JOHN BLANER CO.
Corner Meek & Elm, Sharon, Pa.

For Getting Into Production Quickly



use **ESCO** **MIJIT DRILL JIGS**

Saves You Time—Low In Cost—Increases Production

Durable, simple and sturdy, MIJIT Drill Jigs are priced low enough to warrant the use of the number and assortment required for efficient economical production. There are four models for various types of work.

Consult us without cost or obligation if you have a difficult or expensive machining operation.

Or write for a new bulletin giving full information on Esco Drill Jigs

Esco Engineering & Sales Inc.
4855 Fourth Ave., Detroit, Mich.

ARMGLO

Manufacturers of Resistance Welders—Foot, Motor, Air and Hydraulic operated.

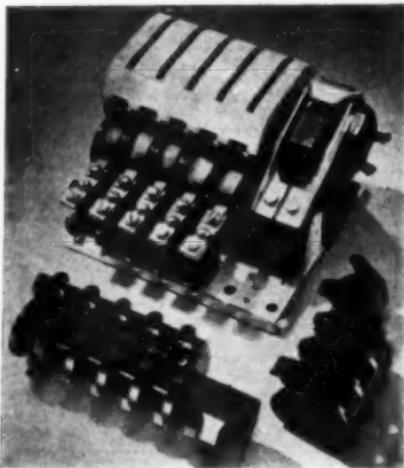
Standard and for specific applications with and without electric timing control.

Bench type filing and sawing machines and abrasive band finishing machines.

ARMGLO COMPANY

Milwaukee, Wisconsin

used in a wide variety of applications where many millions of operations are required, it must be reliable, compact and simple in construction. It must be long lived and possess versatility of accessory combinations.



VICE

FOR DRILL PRESS

With and
Without Jig
Attachments

Often used
on Miller,
Shaper or
Planer.

6",
9",
12"
Jaws

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KNURL HOLDER

FOR TURRET LATHES

Operates like
Screw Die.
Adjustable
within capacity.
Straight Cut
Knurls in
Swivel Lugs
Produce Stand-
ard Knurling.



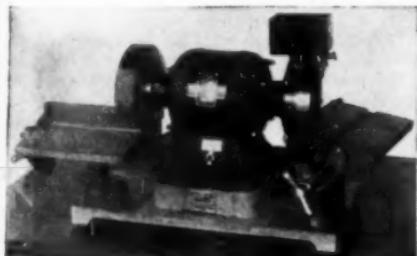
THE GRAHAM MFG. CO.
76 Willard Ave., PROVIDENCE, R. I.

This plastic shaft combines in a single piece of material, the following parts and functions:—bearings on which to rotate an assembly of parts; support for magnet armature; individual bearing, stop, guides and barriers for each of five contact tips (three in short form); guides and barriers for each of five flexible braid connectors; spring seats for each of five movable contact tips; molded arms with which to operate up to seven auxiliary switches (five in the short form) that may be used in the final application; molded arms with which to operate mechanical interlocks and complete high quality insulation for all of the above mentioned parts.

Making possible these various functions by means of a single molded piece of plastic material means that there are no chances for loosening of parts as there might be if they were assembled by screws and lock washers or rivets. This assures permanent maintenance of factory adjustment as well as long life

FOR CARBIDE TIPPED TOOLS THE ALL IN ONE TOOL GRINDER

Complete with ——



TWO WORK TABLES

ONE 6"x1½" GRINDING WHEEL

ONE 6"x1½" FACE DIAMOND
SET LAP

ONE PROTRACTOR

110 VOLT, 60 C. A. C. MOTOR
1750 R. P. M.

PRICE COMPLETE.....\$108

220 V. 60 C. 3 PHASE MOTOR \$5.00 extra

230 V. D. C. MOTOR \$10 extra, PEDESTAL IF DESIRED \$20 extra

DELIVERY FROM STOCK

T. C. M. MFG. CO.,

Harrison, N. J.

NICHOLSON CONTROL VALVES

are made in two, three and four-way types for air, oil, water, steam, gas, etc., pressures to 5000 lbs. Style E is a general purpose valve for pressures to 300 lbs. Various metal combinations to suit any medium. Style J is for air and oil only, pressures to 125 lbs. Style H is a balanced hydraulic valve for pressures to 5000 lbs. We also manufacture foot, solenoid and motor-operated valves.



Style J



Style E



Style H

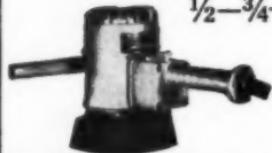
Bulletins on request.

OTHER NICHOLSON PRODUCTS: Mandrels, Arbor Presses, Flexible Couplings, Steel and Stainless Steel Floats, Steam Separators, Steam Traps, Air Separators, Air Traps, Air Vents, Etc.

W. H. Nicholson & Company
117 OREGON STREET WILKES-BARRE, PA.

CUTS GRINDING COSTS

1/2—3/4—and MORE



HEAVY DUTY

3 Phase
60 Cycle
No Brushes

GASTON POWER TOOLS
2655 W. 95th St., Evergreen Pk. Ill.

L-R
FLEXIBLE COUPLINGS

**ADDS YEARS
TO
MACHINE SERVICE**

Get all the facts as to how this new HEAVY-DUTY L-R Type H Coupling handles real heavy duty jobs. Non-lubricated type with exclusive L-R features for better service at lower cost. New free catalog ready.

Write.



TYPE H

Lovejoy Flexible Coupling Co.

5036 W. LAKE ST.
CHICAGO ILLINOIS

because of complete absence of loosening and pounding.

The fact that these various functions are obtained from material that possesses high insulation qualities permits the closest possible spacing between parts such as contact fingers and connectors, which must necessarily be alive. With conventional design, additional space would have to be allowed for metal guides and supports. The plastic material used, in addition to being a high grade insulation, provides low friction bearings that are inherently free from corrosion or lubrication troubles.

Colonial Press Bulletin

Bulletin No. VBS-40 covering its new line of "Senior" presses has been issued by Colonial Broach Company, 147 Jos. Campau, Detroit. The new presses range from 1 to 10 ton capacity and from 18" to 42" stroke. They are completely hydraulic in operation and designed for general purpose use, including assembly, straightening, and broaching work.

Hotel Essex

- Guaranteed comfort—and we mean it. Latest colored tile combination tub and showers—newly furnished and decorated thruout—You'll like it.

**\$1.75
SINGLE**

Ellis at Larkin

**\$2.50
DOUBLE**

San Francisco, Calif.

ELIE ESCALLIER, Mgr.



Janette Speed Reducers

FOR SLOW SPEED DRIVES

SEE OUR EXHIBIT OF SPEED REDUCERS—CONVERTERS
MOTOR GENERATORS—SPACE 213—At 14th National

Exposition of Power & Mechanical Engineering—

Grand Central Palace—New York

December 2nd to 7th, 1940

Ask For Your Copy of Our 100-Page Bulletin

Janette Manufacturing Company
556-558 West Monroe Street Chicago, Ill. U.S.A.

One of the 18 styles of reducers available — flange or foot mounting bases.

All Roads Lead To
COMFORT
 IN
DETROIT
 500 ROOMS
 All With Tub & Shower
 from \$1.50
FRANK WALKER
 Manager
HOTEL
WOLVERINE

INSIST ON THE GENUINE
Abrasives
 RED BAND
DIAMOND
TOOLS

Look for the **RED BAND**
 of Proved Performance!

Write for newest price list and literature.

ABRASIVE DRESSING TOOL CO.
 1550 BROADWAY DETROIT

BENDING
BRAKES

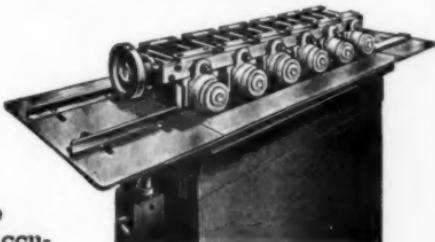
WHITNEY-JENSEN

METAL
TOOLS



Two sets of Rolls—18 gauge capacity—38 Ft. per min.—Accurate individual roll adjustment.

WHITNEY-JENSEN No. 75
ROLLING MACHINE

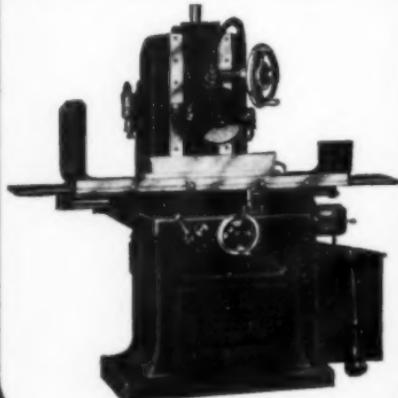


Write for particulars



WHITNEY METAL TOOL COMPANY
 115 FORBES ST., ROCKFORD, ILLINOIS

TOOL ROOM ACCURACY AT PRODUCTION SPEEDS



with
this

Grand Rapids HYDRAULIC FEED Surface Grinder

Vernier wheel has .0001" graduations approximately $\frac{1}{8}$ " apart which can easily be split.

This feature, plus the infinite variations of table travel obtainable by hydraulic means, makes possible the highest degree of precision grinding at production speeds.

WRITE FOR
CATALOG GL-100.

Gallmeyer & Livingston Co.

405 Straight Ave., S. W.
GRAND RAPIDS, MICH.

Sharpening "Curled Chip" Blades

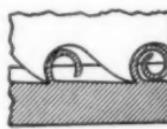
The "Curled Chip" system of high speed metal sawing is already proving its value in many difficult production operations, according to engineers of E. C. Atkins and Co., 448 So. Illinois St., Indianapolis, Ind., who originated this new saw tooth blade. Foreseeing the need for an automatic precision grinder to sharpen the "Curled Chip" saws, Atkins collaborated with Covell-Hanchett Co., in development of the No. 11-30 metal saw sharpener. A battery of these sharpeners is shown.



To preserve the scientific set of the Atkins "Curled Chip" tooth forms, the new sharpener is controlled by a special cam action for the exact clearances of high and low teeth as well as precise beveling. Anti-friction bearings are employed for all working parts of the No. 11-30.



Old Type Tooth



New Curled Chip Tooth

The importance of precision grinding can be appreciated readily from a brief study of the "Curled Chip" system of metal cutting. This depends on cutting with a rolling action, coiling action rather than a pushing or telescop-

ing action. The chips are coiled into the specially curved gullet and spring clear from the end of the cut when tension is released.

It is pointed out that the Atkins "Curled Chip" system differs radically from the action of the conventional hacksaw blade since it eliminates the tendency to grind the chips into fine pieces. Choking of the gullet by irregular filings is the principal factor in slowing up ordinary metal sawing operations and putting excessive demands on power.

It is emphasized that the crisp, clean cutting action of curled chip blades permits maximum speeds and feeds and much longer periods between sharpening.

Automatic Stock Feeding

A new bulletin H-80 presents the complete line of automatic pressroom equipment offered by U. S. Tool Co., Inc., Ampere, N. J., also manufacturers of Multi-millers, Multi-slide machines and die sets.

U. S. slide feeds are designed for accurate feeding. The slide block reciprocates between definite stops at both ends of the stroke, preventing overthrow from momentum. These slide feeds are built in eight standard sizes ranging from SF-00 for stock up to 1½" wide with 1" maximum length of feed to the SF-8 for stock up to 12" wide and a maximum feed length of 12". Larger sizes are also built for special requirements.

Metal Cutting Tool Handbook

An interesting and instructive new ready reference handbook of useful engineering data on metal cutting tools has been prepared by Illinois Tool Works, 2501 N. Keeler Ave., Chicago, Ill. Known as Catalog "E," it is more of a handbook or manual than a mere descriptive catalog of products. Copies will be sent to Production and Engineering Executives who request it on Company letterheads.

**It's easy to hear—
This Acousti-Booth
keeps out NOISE**



• You can hear phone orders easily if you use the new Burgess Acousti-Booth. This remarkable doorless phone booth gives you a "zone of quiet" in the noisiest plant. A patented sound absorbent lining "blots up" noise and insures complete privacy for the user.

Open design of the Acousti-Booth makes it well ventilated and easy to keep clean. No doors, hinges, or fans to wear out. Plenty of room for comfortable use. Used in hundreds of factories and power plants.

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Dept. HM, 500 W. Huron St., Chicago
Please send Free booklet describing Burgess
Doorless Acousti-Booth and how it makes telephoning easy in noisy places.

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BURGESS ACOUTI-BOOTH

Manufactured under Burgess Patents

MODEL NO. 16 "SPECIAL"

*Constructed as per Specifications of
U. S. Naval Aircraft Factories*

Reg. U. S.
Pat. Off.



*Beware of imitations!
Our machine carries the
Butterfly trade mark.*

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10⁸ Table; Model No. L-12⁸ Table.

HARVEY MANUFACTURING CORP.
161 Grand St., New York
Phone: CANal 6-5170

FOR MILLING, DRILLING, SLOTTING, OR PLANING



FOR ONE PIECE— —OR FOR THOUSANDS

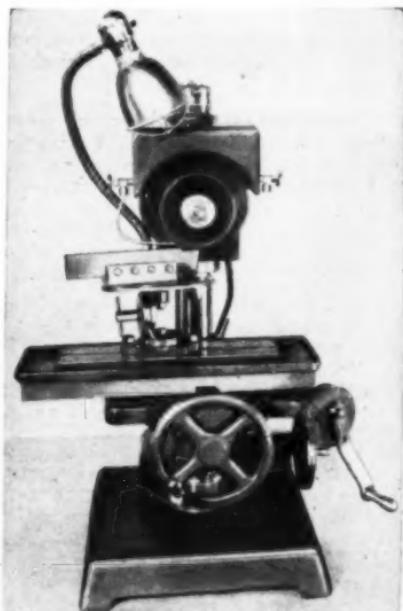
The HARTFORD "Super-Spacer" indexing fixture was designed to meet the demands of modern feeds and speeds. Its unequalled versatility fits it equally well for special work or for production jobs. Quick set-up—rapid, accurate indexing—elimination of error—greater rigidity—all these are yours in this new device.

Send today for complete information.

Hartford Special Machinery Co.
285 Homestead Ave., Hartford, Conn.

Carboloy Chip-Breaker Grinder

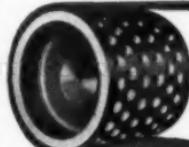
A new grinder for chip-breakers in carbide tools is announced by Carboloy Co., Inc., 11139 E. 8-Mile Road, Detroit, Mich., to meet the chip-breaking problem occasioned by the rapidly spreading use of cemented carbides for steel cutting.



In most steel machining operations with cemented carbides, chip-breakers of some form or another are essential due, first, to the necessity of clearing the chips from the work and, secondly, because of the tremendous increase in chip production.

The first is important from the standpoint of chip clearance in machine-tools, while the latter is particularly vital from the standpoint of operator safety, with chips coming off the work at speeds up to 400 feet a minute or more.

With the new grinder, exact forms of chip-breakers determined as ideal

NO BELT SLIPS WITH VACUUM CUP C. I. PULLEYSPat'd U. S.
Canada
Great Britain30 Day Free
Trial Offer.Solid and Split
Sizes 2¹/₂ to 72¹/₂ Dia.**Shut Off Expense Caused by Slippage
You Save Money on Every Installation****NEW LOW PRICED PRODUCTION LINE****SOME OF SIZES LISTED BELOW Send for List—On the Shelf**

Dia.	Face	Price	Dia.	Face	Price
2 ¹ / ₂ "x2 ¹ / ₂ "	—	\$1.25	4 ¹ / ₂ "x3 ¹ / ₂ "	—	\$2.85
2 ¹ / ₂ "x2 ¹ / ₂ "	—	2.45	4 ¹ / ₂ "x2 ¹ / ₂ "	—	3.95
2 ¹ / ₂ "x3 ¹ / ₂ "	—	2.25	5 ¹ / ₂ "x3 ¹ / ₂ "	—	4.25
3 ¹ / ₂ "x3 ¹ / ₂ "	—	2.55	6" x3 ¹ / ₂ "	—	4.75

We supply Fractional Dia. and Face Pulleys—from large casting stock.

VACUUM CUP METAL PULLEY CO., INC.
12536 Grand River Ave., Detroit, Mich.**Increase
your
Production**

for any given operation, can be duplicated quickly when the tool is re-ground. For this purpose, the tool is clamped in a tool holder mounted on a universally adjustable fixture table fitted with three protractors, to permit adjusting to correct setting in all directions.

The tool is then moved under the wheel to a distance corresponding to the chip-breaker width desired and the wheel is fed down while feeding the table back and forth. The wheel-feed is also provided with graduations so that chip-breakers can be ground to the exact depth desired.

Resinoid diamond wheels of 100 grit are recommended. Coolants recommended in order of efficiency in keeping the wheel open, include—Stadoil, water with just enough soluble oil added to prevent rusting, and kerosene.

The grinder is designed for use with tools up to 1-1/4" wide. Operation is through a 1/4 h.p., 3450 r.p.m., 110 volt 60 cycle single phase dust-proof ball-

bearing motor equipped with reversing switch. Special motors for 220 volts and 25 or 50 cycle current are available at slight additional charge.

Rechargeable Flashlight Battery

Anybody who uses flashlights frequently, should be interested in the new rechargeable storage battery offered by the Ideal Commutator Dresser Co., 1441 Park Ave., Sycamore, Ill.

The battery is sturdy and compact, fitting all popular two-cell size "D" flashlight cases. Housed in transparent Lucite (Du Pont plastic) the electrolyte level can be seen at a glance. Occasionally, distilled water is added by means of a medicine dropper. Filler cap is leak-proof.

Lower voltage inexpensive bulbs are used. One, a screw base type rated at 1.93 volts 450 millamps is designed to give practically the same output as the No. 14 bulb commonly used with two dry cells. For brighter light, a fixed focus lamp is available rated at 1.90

AN INEXPENSIVE ABRASIVE BAND GRINDER**"Built Like A Machine Tool"**

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on belt. Ball bearing throughout, equipped with Allemite lubrication, complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

WALLS SALES CORP.
96 Warren St., New York, N. Y.

CARROLL
Universal Dividing Heads

22 Years of Popularity. 6", 10½".
12" Swing. Right or Left Hand
Type.



WM. CARROLL & SON
1778 Lexington Ave., (Norwood) Cincinnati, Ohio

volts 600 milliamps. The storage battery permits continuous operation at full efficiency within the battery capacity.



Champion
Power Hack-Saw Stand



Built for durability and long life; may also be used as a jack. Has swivel head and maximum adjustment of six inches. Circular upon request.

The Western Tool & Mfg. Co.
Springfield, Ohio

A simple recharging unit which plugs into any lighting socket, makes it possible to recharge the battery quickly and economically. The charger is a small transformer-rectifier unit, so controlled that several hours' overcharging is not at all injurious to the battery, and charging current consumption is said to be less than that required to run an electric clock.

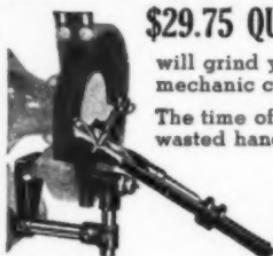
\$29.75 QUICK WAY TWIST DRILL GRINDING FIXTURE

will grind your drills faster and more accurately. Any ordinary mechanic can learn how to do this efficiently.

The time of your highly skilled mechanics is too valuable to be wasted hand grinding drills.

For further information address—

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739 Hennepin Avenue, Pence Building, Minneapolis, Minnesota



Ball Bearing Data

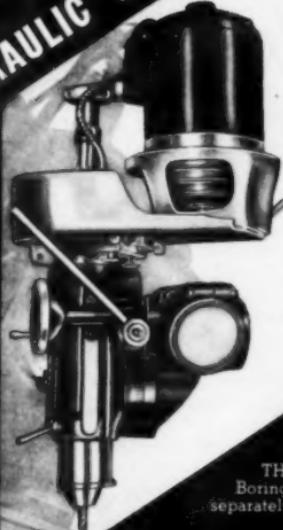
An attractive new catalog, No. 11, presents 24-pages of helpful engineering data on the use of ball bearings. The four-point cone principle is graphically explained. There are many pages of thrust bearing dimensions and load ratings and mounting instructions. Interesting pages of drawings show installations and applications where friction and wear have been overcome and machine operation

improved by the proper application of ball bearings. Solution of ball bearing problems are given on another page and useful hints on the selection of bearings are included.

In attractive, easy - to - find form, many essential facts are included which will help ball bearing users.

Issued by Auburn Ball Bearing Co., 28 Industrial St., Rochester, N. Y., copies will be sent on request.

Eklind UNIVERSAL MILLING HEADS TURCHAN HYDRAULIC DUPLICATING ATTACHMENT



THE MODEL 4 H C EKLIND — TURCHAN

Hydraulic Duplicating Unit, is designed and priced for the average range of work in die shops

making Bakelite, Plastics, Rubber and drop forge molds and dies. Oil pressure controlled by tracer feeds the spindle and tracing arm to follow the model

Die capacity 16" long by width, depending on cross feed of machine. Can increase capacity still more by mounting head on side of overarm.

THE MODEL 4 H EKLIND Universal Milling, Drilling and Boring Head is a most valuable tool room aid. It is offered separately and the duplicating attachment can be added later.

Write today for circular

UNIVERSAL HIGH SPEED TOOL CO.
549 W. WASHINGTON BLVD. CHICAGO, ILLINOIS

"ALNOR" Velometer
An All Purpose Air Velocity Meter

—Instantaneous,
Direct Reading.

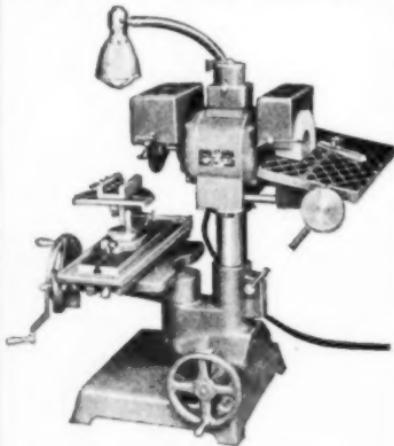
Measures total and static pres-
sures as well as
velocities.

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ILLINOIS Testing
Laboratories, Inc.
150 W. Hubbard, Chicago



NEW and NECESSARY!



Universal Carbide Tool Grinder

When we built our universal Tool and Cutter Grinder we little dreamed of the swan that machine tool would father. We refer, of course, to the Carbide Tool Grinder—a universal machine tool capable of performing all the necessary operations for the upkeep of cemented carbide tools. It's ready to go to work for you, at an early delivery date.

Ask for Bulletin CTG40-11H.

K. O. Lee Company

Aberdeen, South Dakota, U. S. A.

**Austenitic, Tough, Non-
Magnetic Steel**

Manganal—an austenitic, tough, non-magnetic steel containing 11 to 13½% manganese and 3½% nickel is now carried in stock for immediate shipment by Joseph T. Ryerson & Son, Inc., Chicago.

In making available a non-magnetic, abrasion resisting steel which can be welded, a real industrial need has been filled. For example, considerable weight can be saved in building composite structures by welding castings and manganal plates, using manganal only where necessary for wear resistance.

It is emphasized that the 3½% nickel content permits Manganal plates to be welded without a subsequent quenching treatment as there is no loss in toughness when manganal is cooled from the welding temperature. This makes a reasonable structure material of a composition that otherwise is difficult to handle. Welding rod of 18-8 stainless composition has been found to give very satisfactory results when used with Manganal.

Manganal has all the advantages of 11-14% manganese steel in resistance to wear and surface work hardening. Thicknesses up to ½" can be sheared. Manganal can be flame cut, and requires no subsequent heat treatment when formed or punched hot. This characteristic gives Manganal a distinct advantage over 11-14% manganese steel which must be given a full heating and quenching treatment after forming if the original toughness and ductility are desired — a treatment which often distorts the formed shapes.

Chemical composition and physical properties of Manganal are:

Carbon .60 to .90.

Manganese 11 to 13½%.

Silicon .60 to .95.

Nickel 2.50 to 3.50.

Tensile strength 140,000 to 150,000 lbs. per sq. in.

Elastic limit 55,000 to 60,000 lbs. per sq. in.

Elongation in 2 inches, 72½%. Reduction of area 54%.

Hot Rolled Manganal Plates are currently being used for electrical applications where non-magnetic characteristics rather than abrasion resistance, are required. Welders are successfully using Manganal for patching broken and worn-down parts made from 11-14% manganese steel. It is also being used as a substitute for heavy castings weight reduction is important. Manganal is strong and durable, and under proper application, will resist impact and abrasion many times longer than ordinary carbon steel. Typical applications include journal boxes, pedestal liners, wear plates, mill liners, shovel buckets, conveyors, crusher hammers, etc.

Hot Rolled Manganal steel is stocked in 48" x 120" plates in the following thicknesses:—3/16", 1/4", 3/8", 1/2", 5/8", 3/4", 1".

NAILS • RIVETS • SCREWS
MADE TO ORDER IN ANY METAL

New Catalog Will Be Ready Soon.

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Products

CLAY & OAKLAND STS.
BROOKLYN, N.Y.

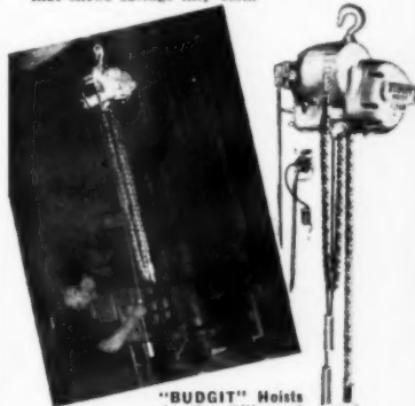
We're for Illustrated Catalog



Lifting burdens too heavy for muscles becomes magically easy with "Budgit" Hoists. Their effortless lifting is fast, safe, and economical. "Budgit" Hoists are portable electric hoists that you simply hang up, plug into any electric socket and use . . . Installed at all places where lifting is done manually or with chain blocks they speed the work, reduce waiting time of men and machines and promote efficiency.

"Budgit" Hoists come in sizes to lift loads up to 250, 500, 1000, and 2000 pounds with speeds to suit today's tempo . . . You can afford "Budgits"! . . . Prices start at \$119.

Send for catalog containing complete information, also, "Time Savings Calculator" that shows savings they earn.



"BUDGIT" Hoists do the lifting at the drill presses for this machining department.

'BUDGIT' HOISTS
SHAW-BOX CRANE & HOIST DIVISION
MANNING, MAXWELL & MOORE, INC.
435 BROADWAY • MUSKEGON, MICHIGAN
Makers of all types and sizes of Electric and Hand Operated Cranes and Electric Hoists . . . Send all your crane and hoist inquiries to Shaw-Box!

Welding Rod Hopper Feeding Machine

A new welding rod hopper feeding machine has been developed by Moslo Machinery Co., 5005 Euclid Ave., Cleveland, O.

Its prime purpose is to pass straightened and cut wires or rods into an extrusion press for application of coating material to welding rods, answering the problem of uninterrupted flow of rods into the extrusion presses.

Capacity of about 500 pounds of wire rods means that minimum operator attention is required. Guide plates of feeding mechanism are arranged so that adjustment is obtained from a single hand screw with positive adjustment assured. Thus it becomes possible to feed from the smallest to the largest diameter rods without fear of interrupted flow because of misalignment.

Speed is controlled through an adjustable drive, permitting absolute matching of feeding speed with whatever extrusion press the feeder may be teamed.

The new feeder is supplied at present in three sizes of hopper to take wire in 18", 24" or 36" lengths. Each machine is capable of handling any length up to its maximum. Right or

left hand operation is at the option of the purchaser and feeding height is matched to the extrusion press.



Industrial Tractor Units

Cullman Sales Co., of New York City and Detroit, Mich., announce their distributorship of Silver King industrial tractor units. These are available in a number of different types for hauling trailer trucks in tandem—with lifts for loading freight cars, loading platforms, etc. Also bulldozer plows for moving coal, sand, gravel and other materials. Street sweeping brooms can also be had.

The model illustrated is a standard type with 7.50 x 20 and 6.00 x 9" traction tires. It is equipped with push plates, front and rear, and rear floor

FACTORY TO YOU HARDENED AND GROUNDED FLOATING HOLDERS



C. R. S. BUSHINGS—DRILL SIZES
.22 ea. .28 ea. .34 ea. .40 ea.

HALCO PRODUCTS 14231 BIRWOOD
COMPANY DETROIT, MICH.



SMALL COST— BIG VALUE

Small original cost—no upkeep. Big value—uses little room, keeps stock in view. 4 arms, 51" high, stacks 10,000 lbs. 5 arms 57" high 12,000 lbs. flat or round stock. Tubing less weight—capacity 3 stands for 20' lengths; 2 for 12' or shorter. Use back to back in center of room or against wall.

Send for details and prices.

WM. S. YOHE SUPPLY CO.
503 Mahoning Road, N. E.
Canton, Ohio



deck. Hitches on front and back are available at no additional cost.

It is claimed that fuel consumption is less than one gallon per hour. Lifts and hoists of mechanical or hydraulic type can be applied, with power take-off.

Four speeds are provided, from 1.8 to 2.5 m.p.h. on low, to 14 to 25 m.p.h. on high.

Turchan Follower Machine

In times like these, every effort is being made to improve the productivity of machine tools—to meet the scarcity of highly skilled labor.



Vernon Combination VERTICAL MILL & JIG BORER

**Equipped with
DIAL
INDICATORS
and
MEASURING
RODS**

Dial Indicator and Measuring Rods available on the longitudinal and cross feeds for precision work. Register to .001".

8 spindle speeds — range 250 to 4200



SLOW OR RAPID TRAVERSE TO QUILL

Latest tool of its kind. Streamlined. Simplest to operate. For precision work. Substantial pyramidal base. Ball-bearing equipped throughout. Quill arranged for slow hand feed (graduated to .001") or rapid one-to-one traverse can be quickly engaged by turning knob and using handle. Maximum distance, Table Top to spindle end, 10½". Movement, sliding head, 10¾". Vertical travel of quill, 3". Longitudinal Table Travel, 12". Cross Table Travel, 6". Saddle Length, 11". Motor, ½ h. p., 60 cycle, 1750 r.p.m.

WRITE FOR BULLETIN TODAY

The Vernon Line of

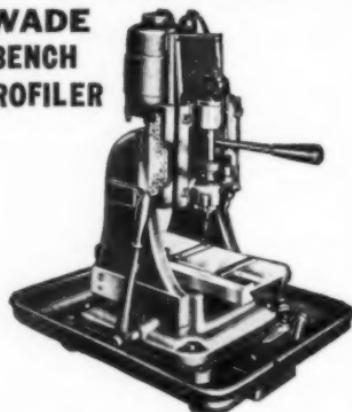


HORIZONTAL MILLING MACHINES,
COMBINATION VERTICAL MILLING
MACHINES & JIG BORERS, & 11" SHAPERS

MACHINERY MANUFACTURING CO.

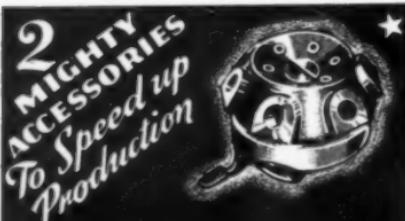
3636 IRVING STREET, VERNON, LOS ANGELES, CALIFORNIA

WADE BENCH PROFILER



For rapid production in recessing and slotting operations.

WADE TOOL CO.
WALTHAM, MASS.
ALSO WADE BENCH LATHES AND
HAND KNUURLING TOOLS



BALL TURRET HEAD

Convert your lathe into a REAL producer. Will hold six tools ready for immediate use. Easily attached—quickly removed—supplied in two models with or without arbor having any desired taper.

SPRING VISE JAW CLAMP

A handy accessory to a bench vise for holding round rods, screws and machine parts from $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter. Prevents round stock from rolling or threaded parts from upsetting. Every man should have one of these work savers alongside his bench vise.

Write for Prices

Milliken Machine Co.

10 Pleasant St., Pittsfield, Mass.

That's why the versatile Turchan Follower Machine should arouse interest. It is readily adaptable to many standard machine tools, particularly milling or boring machines, vertical or horizontal, for surface contouring, die sinking, etc.

The makers emphasize that standard machines equipped with the Turchan hydraulic control attachments are readily mastered by good mill hands, without factory or other special training, permitting many precision operations which would otherwise require expensive special machinery and highly skilled operators.

Another advantage is offered over machines specially built for this work in that a simple disengagement allows a rapid changeover from Turchan controls to the standard machine controls for ordinary work.

Turchan hydraulic controls are already in use on lathes for automatic turning reproduction from profile forms, as described in a previous issue.

The illustration shows an ordinary planer so equipped, enabling it to plane various forms, controlling the raising and lowering of the tool to reproduce contour surfaces from a model. A steel propeller is being planed, reproducing the form within a few thousandths of an inch. The table cutting speed is 50 feet a minute, with 80 feet a minute reverse.

The controls are made by Turchan Follower Machine Co., 8259 Livernois Ave., Detroit, Mich.

ALL ALLOY PORTABLE SHEARS

FULLY
GUARANTEED



No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to $\frac{1}{4}$ " steel plate.

Special Blades for shearing stainless steel.

BREMIL MFG. CO.

1720 Pittsburgh Ave.,

Erie, Pa.

Welding

Particularly timely, because of the important part Arc Welding is playing in the Defense Program, a new publication by The Hobart Brothers Co., Troy, Ohio, will be useful in helping to train operators.

"Arc welding Manual and Operator's Training Course" is a condensed pocket size series of welding lessons taken from Part II of the large Hobart book — "Arc Welding and How to Use It."

The condensed manual will be sent postpaid for 50 cents per copy. The complete welding text book sells for \$1.50 per copy.

The condensed manual is excellent for the beginner who is seeking instruction in the rudiments of the art.

It starts in right at the beginning, covering the basic points, and illustrations help to clarify the text.

Full directions are given for striking and manipulating the arc and for various types of welding jobs with bare electrodes.

A chapter is devoted to welding and cutting with coated electrodes, with many illustrations of typical jobs.

The final chapter explains the procedure in welding light gauge steel. Illustrations show typical welding jobs on sheet metal.



GAGING PRECISION by Touch is only Approximation compared to VISION.



The sense of feeling or of touch as applied to fixed gages when used to determine the accuracy of specified sizes on machine parts, depends upon the sensitivity of the inspector and varies with each individual.

But, a visible indicating hand, moving over widely spaced dial graduations, is something which can be seen with the same degree of accuracy by anybody.

This fact is one of the strongest reasons for using Dial Indicators even for comparatively large tolerances. Send for catalog.

FEDERAL PRODUCTS CORP., PROVIDENCE, R. I.

FEDERAL

PRECISION MEASURING INSTRUMENTS

Chicago • Cleveland • Detroit • Hartford • Muncie
New York • Philadelphia • Pittsburgh • Rochester

As in every art, practice makes perfect—but at the outset, it is well to observe certain necessary precautions and procedures and to understand why.

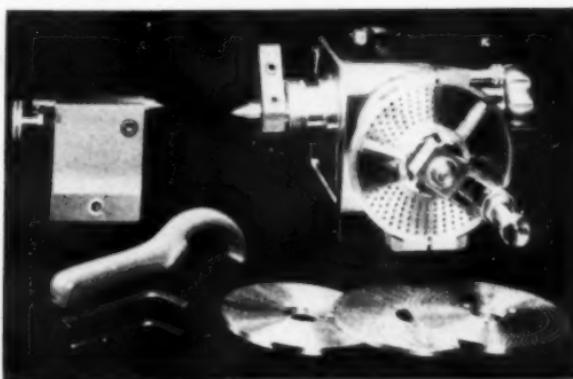
The beginner can derive much benefit from careful study of this condensed manual. As he progresses, he will want to study the complete welding text book. The latter contains 340 pages with 320 illustrations. It is substantially bound in fabrikoid and presents much data and many details which could not be included in the condensed manual.

Hardinge Precision Index Centers

Hardinge Brothers, Inc., Elmira, N. Y., are offering entirely new index centers with their precision tool - room milling machine. These incorporate sturdy construction, large collet capacity and operation features to speed up production in the milling of precision parts.

The compact box-like construction minimizes overall height to act as a sturdy base for spindle section. Spindle is mounted in super-precision pre-loaded ball bearings and, with the same support for the machine spindle, this makes a combination for extreme accuracy and rigidity.

Spindle nose is threaded 2-3/16" diameter—10 threads and interchanges



nose attachments and collets with machine spindle, as well as with similar capacity Hardinge precision lathes. The spindle section swings through an arc of 220° and is graduated in degrees for settings from 10° below horizontal to

T. H. L. FRONT LEVER

BENCH PUNCH

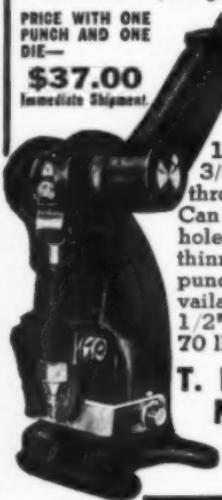
Built for hard, tough work — die can-

PRICE WITH ONE
PUNCH AND ONE
DIE—

\$37.00
Immediate Shipment.

not lose alignment with punch — all parts interchangeable.

Capacity —
1/2" holes through
3/16" steel; 13/32" through 1/4" steel.
Can also be made for
holes up to 7/8" in
thinner metal. Stock
punches and dies available
from 1/16 to 1/2" by 64ths. Weight,
70 lbs.



T. H. Lewthwaite
Machine Co.
(Est. 1890)
311 E. 47th St.,
NEW YORK

STEP-UP PRODUCTION AND SAVE MONEY WITH THESE WIDELY ACCEPTED PRODUCTS

3B Lubricant—better than white lead for those extremely difficult operations on hardened steels. The "last word" for difficult tapping, boring, broaching, threading, piercing and blanking.

Spatter-Ex and Flash-Ex—prevent the bonding of welding spatter and flash. Save time and labor, greatly increase the life of welding machine holder jaws.

Aqua Sol Water Soluble Grinding, Honing and Lapping Compounds eliminate the use of kerosene, give better finish, greater production and improve operating conditions.

Write for information, samples, service.

Wayne Chemical Products Co.

Mrs. Nonscratch Drawing Compounds—
Meltomatic Paste Solder
9446 Copeland St. Detroit, Mich.

—GEARS—

**Spur—Helical—Worm—
Bevel—Miter, Etc.**

We do broaching and all kinds of grinding.

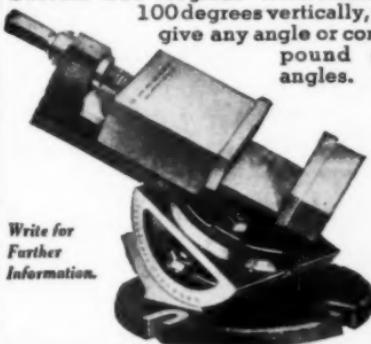
We specialize in grinding hardened steel bushings, cam rollers, etc.

Prompt service and quality has retained a large list of customers for 25 years.

TAYLOR MACHINE CO.
1919 E. 61st St., Cleveland, Ohio

New Britain UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.



Write for
Further
Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

LIMA

Streamlined

GEARSHIFT DRIVES

AS LOW AS \$67.50 LESS BRACKET

Compactness is a superior feature of LIMA Gearshift Motor Units. Counter shafting and the necessity of shifting belts on cone pulleys is eliminated. Shifting is done with one lever, which can be extended to any position that is convenient to the operator.

The belt driven units are designed to drive machines requiring from 1 to 25 H. P., adaptable for either flat or V type belts. The direct motor driven units are constructed in sizes 1 to 25 H. P. Mounting brackets available for all types of machines.

Descriptive material and prices furnished upon request.

THE LIMA ELECTRIC MOTOR CO., 440 N. Main St., LIMA, OHIO

for AUTOMATIC
SCREW MACHINES

Precision

COLLET CHUCK

Faster Feeds
Greater Accuracy
Quicker centering of
Turret and Spindle.

Eliminates Bushings
Drill sets to any length
Grips on Flutes as well
as on Shank.

Collet collapses
 $\frac{7}{32}$ ". Sizes, $\frac{1}{4}$ "
dia. to No. 30
Drill. Positive
thrust screw
stop.

Send for new Bulletin

ERICKSON STEEL CO.
80th & BESSEMER
CLEVELAND, OHIO



20° beyond vertical. A vernier is minutes is incorporated for fine settings.

Draw spindle is of two piece construction to permit swinging spindle through an arc of 220°. Spindle is ground to take directly standard 5C Hardinge collets which have a range by fractions from $\frac{1}{16}$ " to 1" round, $\frac{7}{8}$ " hexagon or 23/32" square.

Precision hardened spiral bevel gears and a nitrided spiral bevel pinion, cut by Gleason, provide a 4 to 1 ratio between spindle and index plate crank. This ratio is particularly advantageous in speeding up milling operations, being 10 times faster than the usual index head ratio of 40 to 1 and, at the same time, gives all of the usual divisions obtainable with the 40 to 1 ratio. Four index plates are furnished, together with a chart listing all of the divisions obtainable from 2 to 360. The index plate mounting is independent of the gearing with the spindle and crank, being engaged between the two by means of the clamp on outer periphery of index plate. This means that work can be chucked and located as desired and index plate adjusted accordingly.

Index head is arranged according to the modern trend for right hand mounting. The head keys fitting table are removable and base of index head as a cross key way to permit placing of spindle parallel to milling machine cutter spindle. The index head swings a 7" diameter. Index head and tailstock have a combined length of 14-3/4".

A similar index head is also offered for spiral milling and rotary motion of the spindle is obtained through a set of change gears from feed screw, actuated by hand or power feed.

The Hardinge Tool-Room Milling Machine, with which the new index centers are used, has a table size of 25" x 6" with a longitudinal travel of 13-1/4", transverse travel of 5-1/2" and vertical travel of 13-1/4". The eight spindle speeds are from 110 to 1850 r.p.m. forward and reverse.

**ELIMINATES
DIAMOND
WASTE!**

CARBOLoy

DIAMOND DRESSERS

For Dressing All Grinding Wheels

Write for Catalog DR-38

CARBOLoy COMPANY, INC.

11139 E. 8 Mile Road, Detroit, Mich.
Cinc.-Cleva.-Newark-Phila.-Pitts.-Worcester, Mass.

Brass Plating

A new brass plating process, said to be 2 to 4 times as fast as present methods is announced by the Plating Division of E. I. du Pont de Nemours & Co., Wilmington, Del.

The process is said to permit heavy deposits of brass of 0.001" or more in thickness, in a reasonable time, where before, heavy deposits could not be obtained at all.

Prepared high speed brass salts provide a simple, quick preparation of a new bath, which will plate immediately, eliminating the "breaking in" period necessary with present processes.

It is explained that the new process operates without polarization at high anode current densities, giving proper composition and color of plate, and the purity necessary to maintain the efficient operation of the bath. Addition agents prevent pitting, improve lustre and prevent objectionable fumes.

The relatively low temperature of operation (40 — 50° C., or 105 — 125° F) assures ease of control and economical operation. A uniform bright color may be obtained over a wide range of current densities. This means that uniform color over recessed objects is now possible. The characteristics of the deposit may be maintained



AMES DIAL INDICATORS

Highly sensitive instruments for indicating size variations in tenths of thousandths. Rugged, modern in design and of highest quality. Various sizes and designs shown in catalog No. 51. . . . Send for copy now.

B. C. AMES CO. • Waltham, Mass.

constantly throughout the process by means of definite chemical control.

The new plating process was shown for the first time at the recent National Metals Exposition in Cleveland. The du Pont exhibit included plating baths in which hardware articles, die castings and many samples brought to the booth were plated.

Another interesting du Pont exhibit presented highly sensitive films used to reveal flaws, cracks, slag and sand inclusions in X-ray pictures.

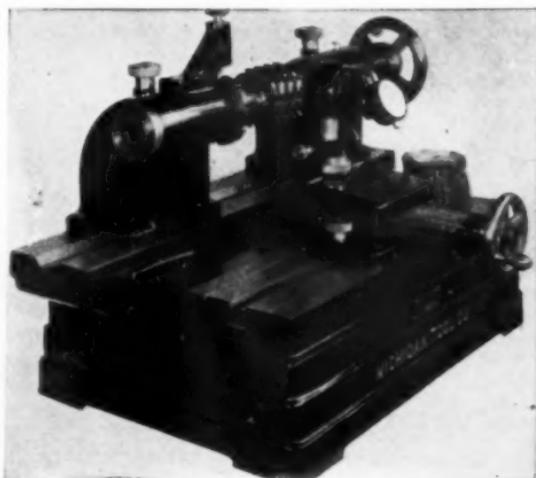
Checking Hobs After Sharpening

A new hob-checking fixture designed for routine checking of hobs after sharpening is announced by Michigan Tool Co., 7171 E. McNichols Road, Detroit. The fixture will check hobs for radial sharpening, spacing of flutes and runout of hubs. It can also be used for checking single form relieved cutters or form gashing cutters for sharpening and spacing.

The fixture is universal in character and has a maximum capacity of 12" diameter and 15" between centers. The dial indicator can be moved in both horizontal and vertical planes, while the head carrying the indicator can be moved parallel to the centers for checking at either end of a long hob. The up and down movement of the indicator is accomplished by means of a micrometer barrel having a graduated dial to permit setting to any desired exact amount.

In checking a radial flute, the indicator contact finger is brought up to center against the half block located on the tail stock, the top surface of this block being on exact center line of the fixture.

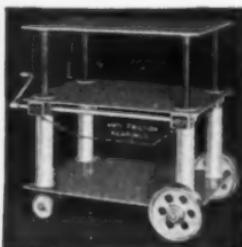
The finger is then set to about $\frac{1}{2}$ or $\frac{3}{4}$ revolution of tension on the dial indicator, and the dial turned to zero. The radial condition of the flute may then be checked by noting whether the in-



dicator reads "zero," while moving the indicator head in and out.

For checking runout on the diameter of the tool, or hub diameter, a bracket is provided on the side of the slide. A standard indicator for checking runout may be mounted on this bracket.

Inaccuracies in readings due to play at the centers is avoided by mounting the index plate on the arbor, which permits making the centers solid. The pawl which engages the index plate is mounted on the headstock of the fixture in such a position as to prevent loosening in its seat.



STYLE A

The HAMILTON PORTABLE ELEVATING TABLE—"PORTELVATOR"

No strained backs or bruised fingers if you let the Hamilton "Portelvator" do the lifting for you. Use it as means of support—Use it to level large overhanging pieces of work—Use it as a bench to work on—An economical and efficient helper—One to twenty ton hand or power operated.

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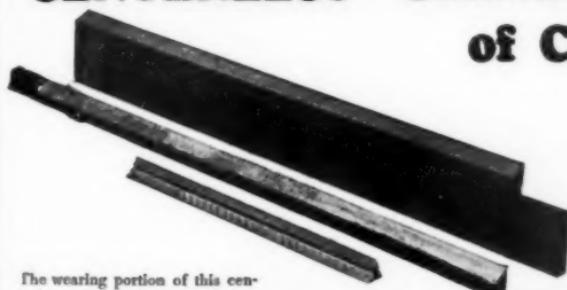
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CENTERLESS GRINDER REST of COLMONOY



The wearing portion of this centerless grinder rest is a welded-on overlay of CO L M O N O Y No. 6, applied to the base, after which it is machined. On machine tool parts subject to great wear and abrasion such as lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, grinder feet fingers, forming and drawing edges, etc., COLMONOY No. 6 is effecting substantial savings due to its long life, ease of application, wear resistance and freedom from galling.

It may be cast, or applied as an overlay, using either gas or electric welding equipment. A trial will convince you of the savings made possible by this new COLMONOY development.

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MUEHLMATT**
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**DRILLING
MACHINES**



The Muehlmann Drilling Machines solve the problem of drilling small holes in the smallest wire gauge sizes.

They are used extensively for drilling Diesel Injector Nozzles, Instrument and Jewelry work. Users report 100% savings on drill breakage.

Muehlmann Drilling Machines are the answer to your drilling problems. Let us tell you more about them.

Send for complete details.

The Hamilton Tool Co.
B and Wayne Sts. Hamilton Ohio

Overall dimensions of the fixture are 38" x 25" x 20". Shipping weight is 450 lbs.

Furnished with each fixture are an index plate, a 1 1/4" x 6" arbor, and one indicator.

Angle Thermocouple Fitting

To facilitate thermocouple replacement, a universal union for angle-type couples has now been adopted by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia. The two halves of this



union fit snugly together in a ground joint making it vapor- and fume-tight. By unscrewing a single clamping nut—which cannot fall off—the thermocouple's hot leg can be detached; or it can be rotated to any angle between 90° and 180°, and locked firmly in place.

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CHICAGO, ILLINOIS

Weldirectory

Procedures for producing all types of welds in mild steel, for welding all metals used to any extent industrially, and for applying surfacing metal to meet any type of wear-action in service are given in a new bulletin by The Lincoln Electric Co., Cleveland, Ohio.

The new "Lincoln Weldirectory" gives complete procedures for flat, vertical or overhead welding of mild steel; single or multiple pass welding of fillet welds in mild steel; flat welding of deep-groove joints in high tensile steels; general welding of high tensile steels; welding of light-gauge steels, 18-8, 25-12, 18-8 SMO and 25-20 stainless, 4-6 chrome steels, chromium molybdenum, nickel chrome alloys, high manganese steel, cast iron, aluminum, bronze, brass and copper; for resurfacing to provide moderate shock and abrasion-resisting welds; rolling or sliding abrasion-resisting welds; and for making tool steel cutting edges on ordinary steel.

The bulletin comprises 58 pages, 8½" x 11" with 165 illustrations and is printed in two colors. A valuable feature is a chart, serving as a guide for selection of electrodes for various applications, in addition to a discussion



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of flat, convex and concave beads. Also a 2-page discussion with illustrations, on the proper use of modern shielded arc welding. A 10-page section covers surfacing, with a chart for selection of electrodes for particular applications. Arc welding accessories are illustrated and described in 8 pages of the bulletin.

Of value to all users of welding, the "Weldirectory" will be sent on request.

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away your
old discs.

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Precision TEST INDICATORS **\$5.00**



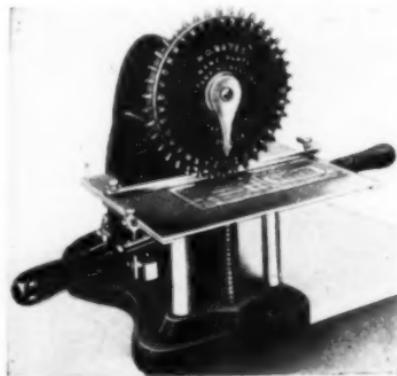
The Koch is the only Indicator with balanced torsion as well as compression springs, assuring positive and sustained accuracy. Each graduation on the scale represents 1/1000 of an inch movement of the plunger. Plunger moves away from instead of towards the lever, preventing breakage of delicate parts by sudden shocks. Dependable in service—low in first cost—worthy of your investigation. Send for bulletin.

The Koch Test Indicator
29 2nd Ave. - Nyack, New York

Bates Develops New Model

Combining the features of the Bates name-plate stamping machines, Nos. 2 and 3, a new No. 5 machine is offered.

The No. 2 machine stamps nameplates up to $\frac{3}{4}$ " thickness and up to 7- $\frac{1}{2}$ " square. The No. 3 stamps pieces up to 2" thick by 8" left to right, by 7- $\frac{1}{2}$ " front to back. The new No. 5 stamps pieces, from .005" to 3- $\frac{1}{4}$ " thick



and up to 9" x 7- $\frac{1}{2}$ " square, permitting the stamping with letters and numbers of assembled manufactured parts or pieces and also permitting the stamping of name-plates after assembly where practical, providing the over-all dimensions do not exceed a size of 9"x8"x3 $\frac{1}{4}$ " thick.

The new No. 5 has a double row heavy duty SKF bearing in the die wheel for easy turning and accuracy. By means of the powerful screw press-



Get 2 for 1 with this new COMBINATION CENTER GRINDER & DRILL PRESS

To change from a Center Grinder which dresses the angle accurately and assures accurate grinding on successive operations to a sturdy, accurate Drill Press—simply loosen one bolt, raise dresser up full height and swing out of way. Floor type, furnished in any length, complete

with motor, diamond and grinding wheel. Four speed V-Belt drive to handle most any range of work. Write for Bulletin No. 10.

\$197.50

F.O.B.
Detroit

Standard grinder,
complete with 110-
220 volt motor.

Dalzen Tool & Mfg. Co., 511 Leib St., Detroit, Mich.

ure principle, nearly three tons can be applied, which permits stamping letters and numbers into stainless steel and other alloys. Depth of impressions can be controlled for stamping soft materials and plastics.

No. 5 is furnished standard with any one size of dies from $1/32''$ to $3/16''$, a complete alphabet and set of figures. Special characters can be substituted if desired and extra die wheels can be furnished for interchanging to stamp several sizes in the one machine.

Special fixtures are made to order, to hold shapes and contours that do not fit into the standard machine. The new Machine is particularly adaptable to stamping numbers, letters and other characters into aeroplane and motor parts, also gauges, guides and dials used in the new preparedness manufacturing program.

The No. 5 Machine is shown with a stainless steel name-plate size $7'' \times 3\frac{3}{4}'' \times 1/16''$ thick in marking position. It is made by H. O. Bates, 257 N. Broad St., Elizabeth, N. J.

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Available in Noiseless Spinning and Vibrating Hammer types—also Vertical and Horizontal Multiple Spindle Spinning Machines.

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Master Collets with Diamond - Serrated Pads



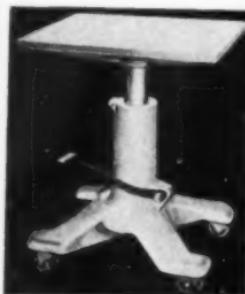
SUTTON Master Collets for screw machines are fitted with interchangeable and replaceable pads with diamond serrations. They grip tighter under less tension. Selected steels and expert heat-treatment give the master long-life spring tension and the pads high resistance to wear.

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Accessories for Screw Machines



SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied $25\frac{1}{2}^{\circ}$ by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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Rayon manufacturer ordered trial unit November, 1938; has reordered 23 to date. One of the "big three" of aircraft has reordered 16 to date; another firm several for each of nine plants.

ARIDIFIERS effectively remove moisture, oil, dirt and fine scale from compressed air and gas lines by centrifugal force. Contamination impinging on the rapidly revolving vanes of the rotors (air-propelled with no appreciable back pressure), is flung to the walls and washed by collected moisture to a trap.

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The ARIDIFIER
Dries and Cleans Compressed Air

"Red Band" Diamond Dressing Tools

A new and improved line of diamond tools, known as the Abrasive "Red Band" series, is announced by the Abrasive Dressing Tool Co., Detroit, Mich. This series is distinctive in that it can be identified quickly and easily by a brilliant red band on the shank.



The makers emphasize that in addition to the "Oxide-Free" process which secures the diamond in the tool for the entire useful life, many other exclusive production methods have been incorporated to assure new high standards of economy and efficient performance.

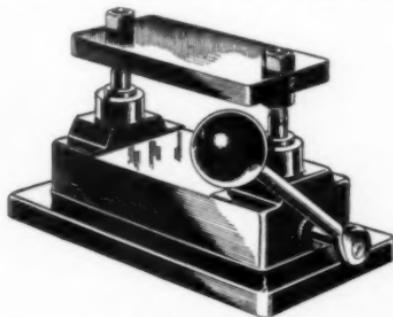
The Abrasive Red Band No. 11 is versatile in application. It contains 3 rows of diamonds, precisely spaced and staggered to permit either single-stone dressing or cluster-type dressing, merely by regulating the drag-angle. It can be used for large radius trueing, surface grinders, medium cylindrical grinding and all other tool-room dressing.

There are 11 diamonds in the Abrasive Red Band No. 11, weighing approximately 1.25 carats. Other tools in the new series are specially designed to meet every general diamond tool requirement.

Mohr Universal Drill Vise

Mohr Lino-Saw Co., 126 North Union Ave., Chicago, announce a new Universal Drill Vise, said to effect remarkable savings in time, tooling and drill fixture costs.

Adaptable for a wide variety of drilling operations, this device is said to be unusually simple in manipulation.



A slight pull on a ball handled lever locks the work securely in place; work is released by moving the lever in the opposite direction. Complicated adjustments, screws, bolts, or nuts, requiring tightening or loosening are said to be entirely eliminated.

The vise is reported to be entirely practical for use as a standard drilling jig. By using different drill bushing plates and adaptors, it may be used for a wide variety of drilling operations, since it is only necessary to equip the unit with relatively inexpensive bushing plates and adaptors. On long runs, however, or in cases where re-runs of the same part occur with considerable frequency, the vise may be used as the base for a permanent fixture, and the bushing plate and adaptor fastened permanently in place.

The vise is 9" long x 5" wide over base; weighs approximately 14½ lbs. Bushing plate 6½" x 3" furnished as standard equipment and extra plates to meet an almost unlimited variety of requirements are available. A 40 to 1 compression ratio is maintained. Leader pins run in hardened steel ground bushings.

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1 Battery of 3 Lockers each 12" wide x 12" deep x 60" high with hat shelf, coat hooks and attachment for locks.

(Locks Extra) — \$14.65

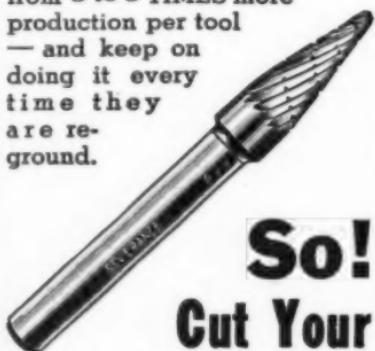
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GROUND To Give Keenness

these Midget Cutters often give 7 to 10 times the increase in production per dollar of tool cost.

And what's more—Severance guarantees that they will give from 3 to 5 TIMES more production per tool—and keep on doing it every time they are re-ground.



**So!
Cut Your**

Rotary Filing costs like one *Chief Executive who writes, "It will cut our tool costs at least three-quarters."

Write for Catalogue No. 12. Every Tool Man—Supervisor, Engineer or Designer—will want this little booklet, so pack full of time and money-saving ideas.

Profusely illustrated, it shows many unusual cutters and applications, lists Standard Midget Milling Cutters, "Chatterless" Countersinks, Tube Burring Cutters and Inside Burring Cutters as originated by

* Name on Request

Severance Tool Mfg. Co.
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A "Shimmy" Sander

The WYCO "Shimmy" sander is a new development of a curved and flat surface oscillating sander, driven by means of a flexible shaft machine.

It has an actual $\frac{5}{8}$ " stroke and is counterbalanced to offset vibration.



The sanding pad is made of thin flexible steel and curves easily in both directions. This is helpful in sanding curved surfaces on furniture as well as for wet or dry sanding of filler coats in automatic work. In combination with the WYCO-Matic polishing machine, the sander is used interchangeably with flannel or lambs wool polishing drums. The WYCO-Matic is available in single speed (1800 r.p.m.) and in three speed models (900, 1800, 3600 r.p.m.). The Sander operates most efficiently at 1800 r.p.m.

It is made by Wyzenbeek & Staff, Inc., 836-38 W. Hubbard St., Chicago, Ill.

McMAHON

Adjustable Angle
Plate

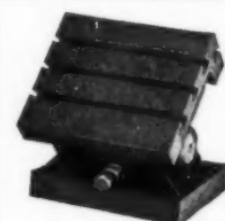
For grinding any
angle accurately.

Two sizes

Model "A" with T slots
 $3\frac{1}{2} \times 3\frac{1}{2}$ \$12.

Model "B" with tap hole
 $6\frac{1}{2}$ \$30.

Desirable territory
open for dealers



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DAYTON, O.

Toledo Toggle Drawing Presses

The Toledo Machine and Tool Division of E. W. Bliss Co., 1420 Hastings St., Toledo, Ohio offers a new line of heavy duty toggle drawing presses. The No. 2-E10-86 illustrated is of four piece steel tie-rod construction with shrunk in tie rods, and the castings are of high alloy semi-steel.



All gearing, eccentrics, etc. are enclosed in the crown of the press. Covers are easily removable and are practical in protecting bearings and working mechanisms.

Lower motion is independently driven and electrically synchronized. Other features include triple gearing, V-belt motor drive, hydraulic friction clutch with disc brake, electric push button control, hydraulic operated brake for stopping the flywheel after the power has been turned off, and a slide counter-balance by air cylinders.

Bed area is 62" F. to B x 86" R. to L.; 650 tons capacity of plunger slide; distance from bed to slide with stroke down and adjustment up, 75".



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Nearly every user reports some new and different uses for the Builders "T" Surface Grinding Machine — and agrees that it is one of the handiest machines in the shop. If you will write us, we'll gladly cooperate in finding out whether or not the "T" is suited for the particular grinding job you have! Ask for Bulletin V644, too.

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IRON FOUNDRY RHODE ISLAND

THE PRECISION UNIVERSAL TOOL HEAD

ADJUSTABLE While Running!
brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machine or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, under-cuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

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When you purchase a STEEGE Drive for your lathe, shaper, miller, etc., you're protected by our broad 5-year guarantee.



STEEGE Drives are easily installed—prices \$35.00 up—sent on 30 days' approval. *Let us send catalog.*

W. L. STEEGE MACHINERY CO.
(Our 23rd Year)
548 W. Monroe St., Chicago, Ill.

Torit Dust Collectors

Self contained units for carrying away dust laden air around grinding, cutting and polishing wheels have been developed by the Torit Mfg. Co., 305 Walnut St., St. Paul, Minn.



The dust laden air is drawn from the hoods surrounding the grinding wheels, down through a compartment behind the motor in the cabinet and then up through a set of filter bags. Heavy particles fall into a tray beneath the bags—the finer dust is drawn into the filter bags and adheres to the outside of them. Filtered air passes through motor chamber, cooling the motor, and then out exhaust vent.

Numerous types and sizes are available for many kinds of service, all of which are described in a new bulletin.

"Unbrako" Screw Bulletin

Standard Pressed Steel Co., Box 559, Jenkintown, Pa., has issued an attractive and interesting new bulletin featuring their complete line of Unbrako screws.

HANDY IN ANY PLANT

This versatile Silver King Tractor will be a most useful addition to your plant. Hard jobs are made easy. Long hours shortened. Heavy loads made light. Pushes, pulls, lifts. Reasonable first cost. Low upkeep. *Let us tell you how you can use this machine to advantage.*

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Detroit
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Fruehauf Trailers, Detroit, Mich., arc weld the frame work for trailer bodies in special jigs that are themselves of arc welded steel construction. Four welding operators and two helpers work on each jig. Here is shown the fabrication of a body side panel framing. (Photo Courtesy Hobart Brothers Co., Troy, Ohio)

Work Wanted

A NATIONALLY KNOWN MANUFACTURER OF PRECISION MACHINERY HAS FACILITIES FOR TAKING ON ADDITIONAL WORK for: W. & S. Turret Lathes, Boring Mills, Lathes, Punch Presses, Screw Machines, Precision Cylindrical and Internal Grinding, also Sub or Full Assembly Work.

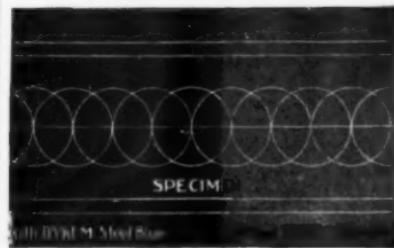
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STOPS LOSSES

making dies & templates



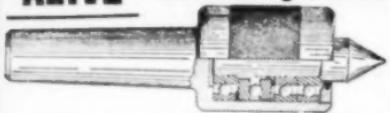
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"ALIVE" Ball Bearing Centers

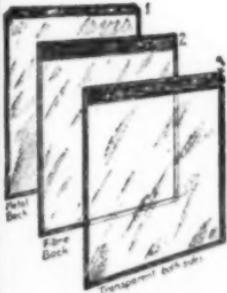


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Send for folder and quotation.

WADE INSTRUMENT CO.
1422 E. 109th St., Cleveland, O.

Washer Stock List

The Wrought Washer Mfg. Co., 2224 So. Bay St., Milwaukee, Wis., producers of washers, expansion plugs, stampings, tools and dies, announces a new stock list—No. 55-D—available to manufacturers upon request.

This new publication lists thousands of washer specifications in various materials, including steel, brass, copper, aluminum, fibre, etc. carried in actual inventory available for immediate shipment. Sizes permanently maintained in stock are so designated, enabling manufacturers to select for standard production as well as new assemblies, the particular sizes on which they can always secure prompt delivery.

Carboloy Grinder Bulletin

Carboloy Co., Inc., Detroit, Mich., has released technical bulletin No. GT-121 covering its new chip-breaker grinder for use with cemented carbide tools designed for machining of steel. Complete operating instructions are given including types of wheels to be used, coolants, methods of exactly duplicating desired chip-breaker shape and size desired, etc.

Pier Welder Bulletin

Condensed Spot Welder data is included in a new 4-page folder just published by the Pier Equipment Mfg. Co., 900-20 Cross St., Benton Harbor, Mich., makers of Ace spot welders. Information on the manually-operated types and on the automatic types is segregated with brief descriptions concerning applications of the various sizes, which run up to 50 KVA.



The "BABY GIANT" VANDERBEEK Universal Joints

are obtainable in two sizes—the "Baby Giant" for instrument and control work; and the "Giant", with hardened and ground working surfaces for heavy duty work.

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26 FRANCIS AVE. - HARTFORD, CONN.



Delta Surface Plates

For years, shop men who wanted accurate, convenient surface plates for layout work had to purchase high priced, hand-scraped precision plates—or else use plates that were more or less makeshifts without squared edges or ledges for clamps. To meet this obvious want, the Delta Mfg. Co., 633 E. Vienna Ave., Milwaukee, Wis., announces two new reasonably priced surface plates, measuring 15" x 8" x 3" and 16" x 22" x 3" that are claimed to give the user everything he needs. They provide a true surface to start with a rugged design and properly ribbed casting to prevent distortion, ledges at the edges of the plate for clamping purposes, and edges that are square with each other and square with the face. In addition, it is pointed out that the plates may be made into precision plates simply by scraping to a master plate or to each other. The

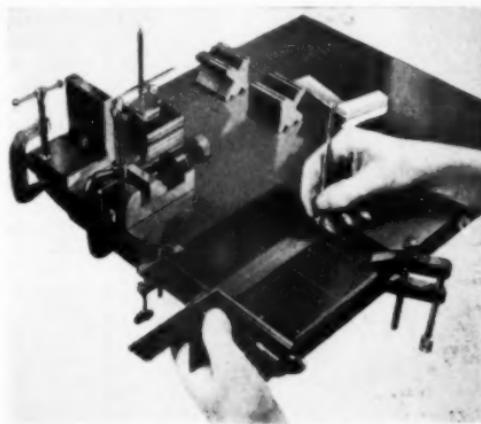


illustration shows how angle plates, vises, etc., may be clamped to the plate and how convenient the squared edges are for laying out work clamped to the plate.

Clean,
SHARPLY DEFINED
Scribed Lines

SECURED QUICKLY, EASILY
AND ECONOMICALLY WITH

Micicro
Supreme

LAY-OUT DYE

TRIAL OFFER: A handy five-ounce Combination Brush-In Can...ideal for shop use and for trial purposes...for only

40¢

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6346 E. Jefferson Ave., Detroit, Mich.

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SAVES AN AVERAGE OF \$4.80
EACH HOUR IT'S USED



Inside and outside cuts on dies, shoes, templets and endless other jobs can be done in a small fraction of the time required by former methods. Saws, files and polishes. A highly developed, large capacity machine.

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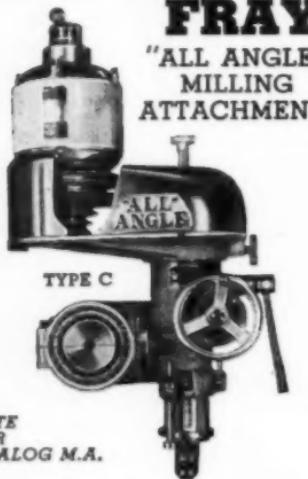
THE TANNEWITZ WORKS

GRAND RAPIDS - MICHIGAN



These No. 0 B. & S. Cams Cut to Your Layout—\$7.65 complete.

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1871 Clybourn Ave. Chicago, Ill.



WRITE
FOR
CATALOG M.A.

FRAY MACHINE TOOL CO.
GLENDALE, CALIF.

Thermal Bottle Oiler

A new, visible, bottle Oiler, to replace ordinary oil cups is announced by the Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee, Wis.

It automatically lubricates solid, wick, or waste - packed bearings. On the slightest temperature rise, the Oiler discharges a few drops of oil. As soon as the bearing receives this oil, it cools and the feeding stops automatically. This operation repeats without attention.

A unique feature is the adjustable feed. Through a simple turn of the Thermo-Dome a port hole opens or closes, regulating the flow of oil.

The oil supply is visible and one filling lasts a long time. The reservoir is unbreakable and all metal parts are of solid brass, bright cadmium plated for beauty and easy cleaning.

Made in one, two and four ounce capacities. Installation can be made in less than 60 seconds without special tools. A wide range of adapters makes 95% installations possible without drilling or tapping.

Eliminating guesswork and removing the human element, the new Thermal lubricating control makes oiling of the bearing sure, so long as there is oil in the reservoir—and that can be checked at a glance.



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Over-Running—Friction—Single Revolution—Slip—Special

THE HILLIARD SINGLE REVOLUTION CLUTCH

An automatic clutch for intermittent and positive drive. Especially valuable for cutting or punching operations, packaging machinery, etc. Simple trip makes it suitable for mechanical, electrical or manual control. Write for booklet giving full information.

THE HILLIARD CORPORATION - 126 W. 4th St., Elmira, N. Y.
Chicago Office, 201 North Wells St.

HILLIARD CLUTCHES • ELMIRA, N. Y.



Here's how to get real value from your grinding wheels. Dress and true them regularly. Use Vincent Improved Huntington dressers equipped with Vincent **high-carbon tool steel cutters**. Your mill supply distributor can supply them, and they cost no more than the ordinary kind.

Insist on the dresser with the aluminum finish.

Write for descriptive catalog sheets.

THE VINCENT STEEL PROCESS CO.

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Wickes Boiler Co., Saginaw, Mich., one of the country's comparatively few shops equipped completely for "Class I" work, finds it a simple matter to double-up productive capacity when necessary, by putting two welding operators to work at different parts of the same assembly. (Photo Courtesy Hobart Brothers Co., Troy, Ohio)

USE ECONOMY — DERIVE ECONOMY



SOCKET HEAD
CAP SCREWS

MILLED
FROM BAR



HOLLOW
SET SCREWS

MADE OF
ALLOY STEEL



ECONOMY MACHINE PROD. CO., 5207 Lawrence Ave., Chicago, Ill.

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ZIEGLER
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TAPS and REAMERS



- AUTOMATICALLY compensates for machine spindle misalignment, eliminating over-sized or bell-mouthed holes.
- Helps produce unbelievable accuracy on both new and old equipment.
- Furnished with male or female taper. Straight, threaded or special shanks to fit any machine used for tapping or reaming.

W. M. ZIEGLER TOOL CO.

Marquette & 12th Sts.,

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**DON'T
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Effect a 30% to 75% saving in tool costs, by having your worn-out or obsolete tools made over by RENU — and guaranteed as good as new, both for appearance and performance.

RENU TOOL CO. • 275 E. Milwaukee • DETROIT

**ReNu
IT!**



Bridgeport No. 4 Trimmer

A handy new bench trimmer that should be especially useful in pattern shops has been developed by The



Hardware Specialties Mfg. Co., Stratford, Conn. Known as the Bridgeport No. 4, it will cut square and miter joints at any required angle. It is accurately graduated and the keen, lever-operated knives cut with a powerful shearing action that gives a smooth and accurate finish.

Fastening Devices

A unique schedule of prevailing discounts on fastening devices such as bolts, nuts, screws, washers, etc., is available to users of such merchandise, from the Manufacturers Screw Products, 216 W. Hubbard St., Chicago, Ill.

Much valuable data including a most complete commodity index, items in stock, f. o. b. points, plating information, delivery time, specials, terms, etc., is compiled on one side of this handy sheet, enabling a busy buyer to hang the schedule as a wall sheet or place it under the glass on his desk for ready reference.

One Tool — or Entire Tool Programs

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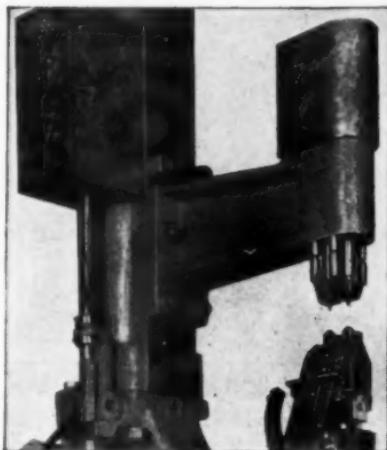
**DIES—FIXTURES—SPECIAL MACHINERY
CONVEYORS—INJECTION OR COMPRESSION MOLDS**

Chicago Riveter Electrically Actuated

A new type of Chicago automatic multiple rivet-setter is electrically actuated by the positioning of the work over the anvils. It requires no foot motion by the operator and is claimed to provide higher production speed and to maintain a more uniform quality of work.

In the two-rivet model illustrated, the operator places the work over the projecting parts of the anvil and brings the pieces down, exerting a slight pressure on the work rests to close an electrical circuit through a micro switch in the housing below. This trips a solenoid which engages the flywheel clutch, feeding and setting the rivets at a single stroke of the machine. If the work is not positioned properly, the switch cannot be closed and the rivets will not be fed guarding the safety of the operator and reducing spoilage to a minimum.

The device is optional equipment with all automatic riveters made by



Chicago Rivet & Machine Co., 1855 So.
54th Ave., (Cicero P. O.) Chicago, Ill.



Why Not Buy The Original Electric Etcher?

MARK IRON AND STEEL
THE ETCHOGRAPH WAY

New ELKONITE TIP pencil.
New Baby Grand Model at a
lower price.

**2,000
in use**

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42 Church St.,
New York, N. Y.

Mechanics Through the Ages



AS EARLY AS 1500

LEONARDO DA VINCI DEVISED THIS AMAZING SAWING MACHINE WITH AUTOMATIC FEED! THE WATER WHEEL SHAFT DROVE THE SAW BY A CRANK AND CONNECTING ROD, WHILE A HOOK OPERATED FROM THE ROD ACTED UPON A RACHET WHEEL TO ADVANCE THE CARRIAGE.



TO HASTEN

MASS PRODUCTION OF AMERICAN GUNS AND SHELLS DURING THE LAST WORLD WAR, LUCIEN I. YEOMANS, CHICAGO INVENTOR DEVISED A WAY TO BUILD GIANT PLANERS AND LARGE BORING MACHINES OUT OF CONCRETE, IRON AND STEEL! CONSTRUCTION TIME WAS CUT FROM YEARS TO MERE MONTHS.

WHEN SAMUEL CROMPTON OF BOLTON, ENGLAND, DEVISED HIS SPINNING JENNY AND BEGAN TURNING OUT SUPERIOR CLOTH IN 1779, LOCAL HANDCRAFTSMEN ACTUALLY CLIMBED TO THE ROOF OF HIS HOME AT NIGHT WHILE HE WAS WORKING, AND TRIED TO PEER IN THE WINDOWS TO LEARN HIS SECRET. TO FOIL ENRAGED WORKERS, CROMPTON WAS FORCED TO DISMANTLE HIS MACHINE WHEN NOT IN USE AND BURY IT UNDER A CLAY MOUND IN HIS GARRET.



HALCO UNIVERSAL HEAD

FOR HIGH SPEED
 MILLING, DRILLING, BORING
 AND COUNTER BORING *ON ANY ANGLE*

PRICE \$195.00

With 10 Speed Back Gear

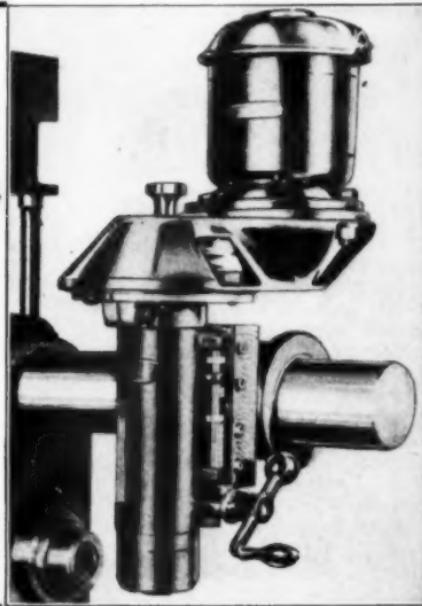
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*Tempering and
 Drawing*

*Write for
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 No. 83*



THIS is a day of action in every tool and machine shop. An efficient, convenient, high speed Despatch tempering furnace will uncork many a bottle neck. Check the new Despatch all around Utility Furnace as described in Bulletin No. 83. It is made to meet today's demands.

DESPATCH OVEN COMPANY
 MINNEAPOLIS

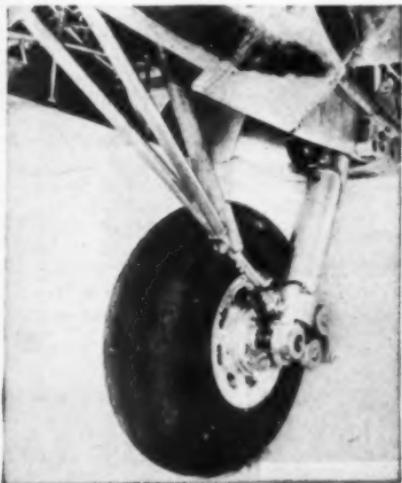
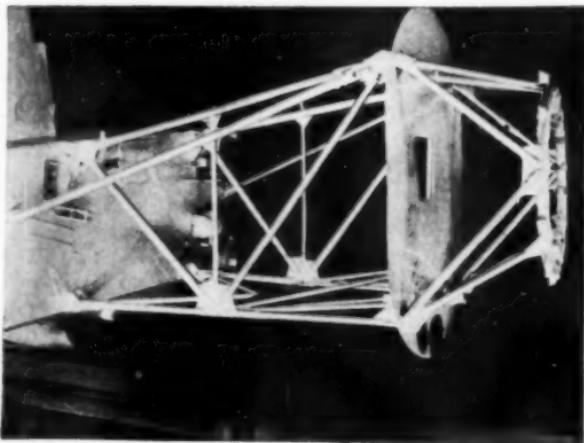
MINNESOTA

New Plane Welding Electrodes

TWO important new applications of the electric arc in aircraft structural welding have been prompted by the urgent necessity for fast production in National Defense.

These new uses for arc welding include fabrication of engine mounts, landing gear forks and other applications.

Both have been made possible by development of a new electrode designed and manufactured by The Lincoln Electric Co., Cleveland, Ohio, expressly for plane welding. Known as "Planeweld", the electrode is of shielded arc type for welding SAE-



4130 and X-4130 chrome molybdenum steels, which are widely used in airplane construction. "Planeweld" is suitable for welding in all positions and when used on steels of the types mentioned is asserted to provide weld metal with physical properties similar to the metal welded. Its welds are smooth without undercutting. There is minimum spatter and good crater conditions and welds made by the electrode on such steels respond to heat treatment quite similar to the parent metal. Planeweld comes in two types—Planeweld No. 1 for material .120" and heavier, and Planeweld No. 2 for light gauge airplane parts (up to approximately 7/64") and airplane tubing.

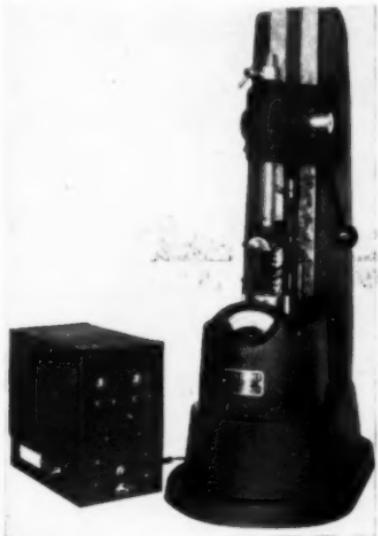
The new electrode, which was developed to overcome difficulties formerly encountered in airplane welding, is available in four sizes:—Planeweld No. 1 in $\frac{1}{8}$ ", $\frac{5}{32}$ " and Planeweld No. 2 in $\frac{1}{16}$ " and $\frac{3}{32}$ ". It is suitable for welding airplane fuselages, tail supports, torque tubes, bomb mountings,

alloy chain links, antenna mounts, chairs, as well as engine mounts, etc.

Link Spring Testing Equipment

A new line of testing equipment for compression, tension, torsion and flat springs has been developed by Link Engineering & Mfg. Co., 1056 W. Baltimore Ave., Detroit, Mich.

Capacities available include the ranges of 0.10 lbs., 0-50 lbs., 0-250 lbs., 0-500 lbs., 0-1000 lbs., and 0-3000 lbs., for manual and motor operation.



Electronic control is available for rapid production testing, with automatic indication of results. Model PB-4-250 wth electronic control is illustrated.

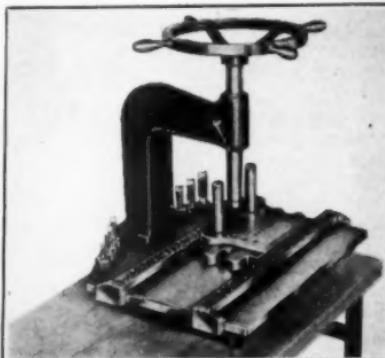
Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

Write for Circular
NIELSEN TOOL &
DIE COMPANY
1859 Gardner Ave.
Berkley, Mich.

*Save TIME
TAPS TROUBLE*
with the New
VIKING TAPPER



You save time because the Viking Tapper eliminates the wasting of valuable time by highly paid skilled men trying to tap holes accurately by hand. One fifth the time is required.

You save taps because tap breakage is practically done away with. This enables the use of high speed ground thread taps at lower cost than carbon taps. The savings on taps alone will pay for the tapper in a short time.

You save trouble because Viking Tappers take the trouble out of tapping.

For Precision Tool Room Tapping use the Viking Tapper. Capacity $\frac{1}{8}$ " to $\frac{3}{8}$ ".

SEND FOR CIRCULAR

**THE VIKING TOOL &
MACHINE CORP.**

14 MAIN ST., BELLEVILLE, N. J.

Lyon Die Handling Truck

The die handling truck shown was designed for taking out or putting in heavy dies in presses where the space for maneuvering a truck is rather limited. Consequently, it was furnished with auto type steer at both ends which not only helps maneuvering in close quarters but adds stability to the truck.

Turning of the wheels is controlled by a turning bar to which a removable handle is attached. This handle is arranged for hand drawing or towing back of a power truck and may be drawn from either end. The truck is arranged so that wheels on either end may be locked in position for drawing at the opposite end. One wheel on each end is furnished with braking arrangement to hold the truck in position when loading or unloading dies.

Capacity is 8,000 lbs. The platform is 24" wide by 60" long by 30" high. Wheelbase is 60"; overall length is 72"; wheel tread is 31"; overall width is 34". Trucks of other specifications of similar design can also be furnished with either a stationary table as shown or with hydraulic elevating table so as to bring the table or platform at varying



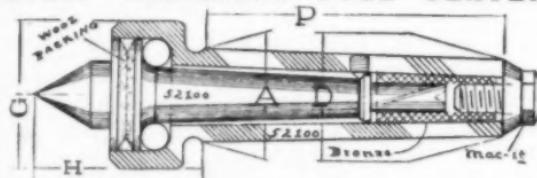
heights most suitable for different applications of die handling.

Manufacturer is the Lyon Iron Works, 569 Madison St., Greene, N. Y.

Oilless Bearing Catalog

A new catalog on Oilless Bearings has been released by the Neveroil Bearing Co., Wakefield, Mass., and is available for Engineers, Maintenance Superintendents, Machine Designers, etc. The catalog is illustrated and describes over 40 Oilless, Alloy Bearings in the Neveroil Graphex and Coprex Groups as well as Oilless Wood Bearings in the Neveroil Woodex Group.

RIGID RESILIENT BULL CENTER



Rigid Tool Company, 2,000 Witherell St., Detroit, Michigan

A disappointed buyer is slow in paying for his disappointment; while we have never yet lost a dollar, on a purchase order; or a customer that we know of; and seldom send out a "Please remit". But we are real cranky, about good work, and good material. The best is none too good. Excellence in Designing and Manufacturing is Excellence in Advertising.

All Morse tapers carried
in stock.

CUT COSTS—INCREASE PRODUCTION

with
DETROIT POWER SCREWDRIVERS

These MAGAZINE FEED POWER SCREWDRIVERS DRIVE SCREWS FASTER THAN EVER BEFORE.

Machine screws, wood screws, brass screws, aluminum screws, self-tapping screws, drive screws, cap screws, special screws, washer assembled screws.

Standard heads, special heads, Phillips heads, slotless heads.

THREE MODELS AVAILABLE

which provides handling a wide range of screw sizes. From a No. 2-56 screw to a 5/8" cap screw.

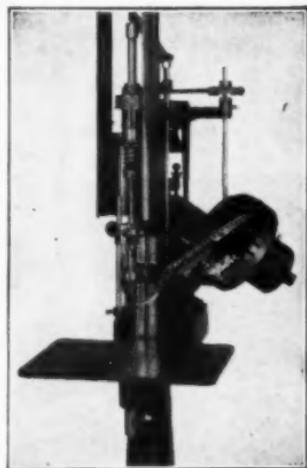
UNIFORM TENSION—NO MARRING OF HEADS

No stripping of threads.

DRIVING TIME: 1 to 2 seconds per screw.

SEND SAMPLES FOR PRODUCTION ESTIMATES

DETROIT POWER SCREWDRIVER CO.
5363 ROHNS AVENUE DETROIT, MICH.



Model B

FOR HEAVY DUTY SHEARING



Three Models of Beverly Shears are offered to fit the job. Model B-1 weighs 16½ lbs.—cuts stock up to 14 gauge. B-2 weighs 32 lbs.—handles up to 10 gauge. B-3 weighs 55 lbs.—takes up to 3/16" mild or 10 gauge stainless steel.

*Reasonably priced.
Send for descriptive circular*

THE BEVERLY SHEAR CO.

3007 W. 110th ST.,

CHICAGO, ILL.

Sling Stressometer

Members of the National Safety Congress recently saw the Macwhyte Stressometer measure sling stress at varying angles.

In the exhibit, safety men were shown how the stresses on each of two sling legs were increased as the angle of use was decreased.

By means of a scale inserted in each sling leg, it was proved that without increasing the primary load, the stresses were doubled with the sling operating at a 30° angle, and nearly quadrupled at a 15° angle.

The apparatus consists of a 20-pound bar suspended at each end by a sling leg in which a scale is suspended. This in turn is connected to traveling nuts fitted to a right and



left screw. By turning a crank mounted on the screw shaft, the angle of inclination was varied from 90° to 10°.

At 90° the 20-pound bar records a stress of 10 pounds on each scale in



LUFKIN CHROME FACE

Jet black markings on the Satin Chrome surface are easy to read even in poor or artificial light. The smooth chrome surface won't rust, crack, chip or peel. That's why you should own a new Lufkin Chrome Face Steel Tape.

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- 10-30 Times Longer Life
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WHEN TALIDE TIPPED WITH
TUNGSTEN CARBIDE WEAR STRIPS
Made in Any Length, Shape or Size

METAL CARBIDES CORPORATION
YOUNGSTOWN, OHIO

each of the two sling legs. At 45° the stress is approximately 14 pounds—at 30° it is doubled to 20 pounds—at 15° it is quadrupled to 40 pounds on each leg or a total of 80 pounds.

The demonstration shows the necessity of taking into consideration the angle of application in determining the safe load of slings for safe materials handling operations.

A safe load chart is available by request on company letterhead to Macwhaye Co., Kenosha, Wis.

"GS" Machinists' Tools

The George Scherr Co., Inc., 122 Lafayette St., New York announces that it has just brought out its own line of "GS" machinists' tools. The line includes machinists' combination sets with drop forged hardened square heads, hardened center head, hardened blade and reversible protractor head; a machinists' combination set with hardened blade and center head, protractor and square head of cast iron, 4", 6" and 8" dividers; 4", 6" and 8" inside and outside spring calipers; hardened and tempered center gauges; thickness gauges; depth gauges; surface gauges; magnifiers; hook, sliding caliper; flexible and narrow tempered rules are also included. A new bulletin illustrates and describes the line.

War Forces Substitutions

Foreign Commerce Weekly articles based on official reports tell of German progress in the economical use of metals. The development of substitutes has been accelerated by the wartime scarcity of imported metals. Com-



HIGH SPEED

**Howell Adjustable Clamps
for Holding Work to
Machine Table.**

Time and Trouble savers—Simply Operated—Extremely Flexible and have Wide Range.

Send for Circular.

Howell Clamp Co.
1373 E. 95th St.
Cleveland, Ohio

Production Drops

When Operators Tire

The Defense Program and expanding industries are constantly demanding higher production rates.

Operator fatigue makes production lag. When grinder operators have to hammer, pull or pry parts free from magnetic chucks repeatedly, they're wasting physical energy as well as valuable time. Tired operators cannot hold the high production rates that are demanded—and there's constant danger of slips and mistakes. Precision work may be distorted or damaged and chuck faces may be marred.

NEU-T-ROL releases the work promptly every time and demagnetizes it. Useful on small chucks, it is absolutely essential on heavy work.



There's a NEU-T-ROL for every size of magnetic chuck. Leading manufacturers will now supply NEU-T-ROL built into your new grinding equipment IF YOU SPECIFY IT. Or you can install it easily on equipment already in service. Write for full details.

Electro-Matic Products Co.
4036 N. KOLMAR AVE., CHICAGO, ILLINOIS

Federal Presses for Federal Jobs



If your plant is called upon to assist in the re-armament program, you need top notch machinery. Federal Presses are now being used throughout the country on government orders. They are proving their worth on every job. Let them help you in obtaining "peak" production at minimum cost. Investigate our complete line of inclinable punch presses before you buy. Write for details today.

FEDERAL PRESS CO.
ELKHART, INDIANA

pound castings for steel backed bronze bearings have been given wider application in an effort to save bronze. Recently, cast iron backings have been used instead of steel, and supporting members up to one meter in diameter have been "coated" with bronze. After machining, the bronze wall separating the journal from the supporting shell is just thick enough to ensure that wear will not expose the underlying steel or iron.

Plastic materials have also received much study with a view to obviating their defects as bearing materials. Heating has been reduced by using more suitable lubricants, through redesigning lubricant channels and through water cooling. Plastics have been employed in bearing installations for ore crushing and sorting machines, rolling mills, revolving cement ovens and calender machines in the artificial rubber and other industries. Plastic materials in the field of bearings for rolls and barrels, it is claimed, are particularly successful.

A further innovation in this field is a new type of bearing made of sintered and pressed iron granules of 1 mm. grain size, having the property of absorbing considerable amounts of lubricating oil in the pores. The bearing requires great precision in manufacturing to prevent clogging the pores.

Blanchard Surface Grinders

Bulletin No. 220 presents the new No. 18 surface grinder offered by The Blanchard Machine Co., 64 State St., Cambridge, Mass.

Large photos give intimate views of the mechanical details. A decidedly interesting feature is the inclusion of 10-pages of photos of typical jobs handled by the No. 18. All told, it is an interesting and complete manual of 24-pages on surface grinding.

Stepping-Up Production

An attractive new bulletin—"6 Ways to Step Up Production" has been issued by Cone Automatic Machine Co., Inc., Windsor, Vt. Three models of 4, 6 and 8-spindle Conomatics are shown, as well as two models of 4-spindle automatics and 5-spindle automatic chucking machine.

Lubriplate Bulletin

An interesting 8-page bulletin entitled "Lubriplate Film," covers Lubriplate in the metal working industry. Lubriplate lubricants are made by the Lubriplate Division of Fiske Brothers Refining Co., Newark, N. J., and Toledo, Ohio, from whom copies of the bulletin may be obtained.

Air-Bloc Hoist

For hoisting light loads up to 700 pounds, Ingersoll-Rand Co., 11 Broadway, New York, offers the Air-Bloc. It is a flexible, welded, link-chain air hoist designed for use in machine shops, assembly lines, maintenance shops, shipping and receiving departments for light lifting jobs practically everywhere.



It is available in three sizes identified as LC-3, LC-5, and LC-7 which are designed to handle loads of 300, 500, and 700 pounds respectively.

The Air-Bloc weighs less than 75 pounds and can be moved easily from one job to another. An automatic up-and down-stop control prevents damage to the hoist from over-run of chain in either direction. Another safety feature prevents the load from dropping even if the air supply fails.

The motor powering the Air-Bloc is a four cylinder, radial-type air motor which the manufacturer states cannot be injured by overloading. Throttle control is sensitive, permitting easy and accurate spotting of the load.



WE'VE INCREASED OUR PLANT BY 4 TIMES SINCE 1935— BECAUSE AMERICAN INDUSTRY IS CUTTING COSTS WITH UNIVERSAL DRILL BUSHINGS

American Industry is more and more specifying Universal drill bushings because: (1) they have super-finished bores, straight and round within .0001; (2) unexcelled wearing qualities; (3) rust-proof black domes; and (4) nickel-steel, cadmium plated lock screws. Available in all ASA standard sizes. Write for facts.



UNIVERSAL
Engineering Company
Frankenmuth, Mich.

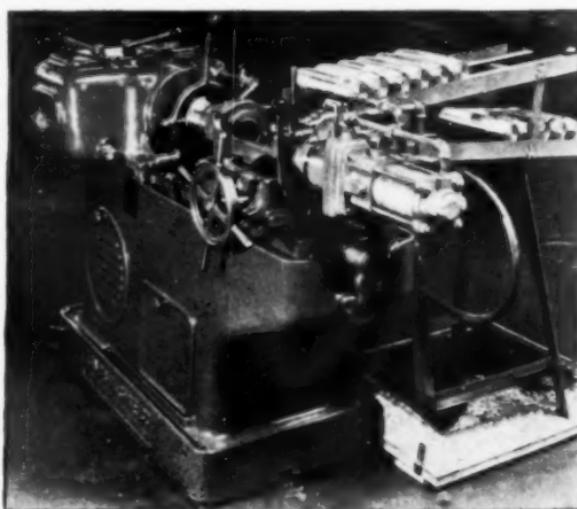
Landimaco No. 1-1/2 R Shell Tapper

The Landis Machine Co., Waynesboro, Pa. now has available, a machine designed especially for tapping the nose ends of shells ranging in size from 75 m/m to 155 m/m inclusive.

It is said to assure accurate tapping operations on an unusually high production basis. The photograph shows it arranged for 75 m/m shells.

The special carriage or holding device comprises a work supporting cradle, a hardened and ground bushing which supports the nose end of the work and a female center which supports the base end of the work.

This female center is in alignment



with the center of rotation of the machine spindle. Movement of the cen-

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YOUR MOTORS • TOOL ROOMS • LATHES
SUPPLY ROOMS • PANEL BOARDS
GENERATORS • MACHINERY • ETC.

THE QUICK, THOROUGH AND ECONOMICAL WAY

With a CLEMENTS

CADILLAC

Portable Electric
BLOWER &
SUCTION
CLEANER



1 HP
2 Speed Model
Illustrated

You can eliminate costly delays, costly breakdowns and costly repairs. Let us tell you how—Ask about our 10 DAYS FREE TRIAL OFFER.

WRITE TODAY FOR COMPLETE INFORMATION

CLEMENTS MFG. CO.
6655 S. NARRAGANSETT AVE.

CHICAGO, ILL.

What H.P. DO YOU REQUIRE
to Machine Steel
with KENNAMETAL?



The new KENNAMETAL Chart No. 5 enables the machine tool operator to quickly determine what Horse Power will be required for a given feed, speed and depth of cut; or, conversely, what feeds, speeds and depths of cut are possible with the H.P. available. Copies sent free upon request.

IMPORTANT NOTICE

KENNAMETAL tools cost no more than ordinary carbide tools — see our new price schedule.

MCKENNA METALS Co.
139 LLOYD AVENUE
LATROBE, PENNSYLVANIA, U.S.A.

ter is actuated by an air cylinder mounted at the rear of the carriage, controlled by a convenient lever. The center is employed to push the work forward until it sets firmly in the ground bushing supporting the nose end. This effects a locking action which holds the work rigidly in alignment for the tapping operation.

The female center and air cylinder are adjustable for shells of various lengths. In effecting set-up changes, it is necessary to merely interchange the bushing which supports the nose end, the work supporting cradle, and the female center for those of correct size.

The machine spindle is equipped with a collapsible tap, designed especially for this work. The tap is made of steel and all parts are either hardened or heat treated and precision ground. The design of the tap provides for internal ducts through which cutting coolant is conveyed directly to the cutting edges of the chasers.

A special feature of the collapsible tap is the tripping collar which also functions as a pilot to assure maintenance of unusually close tolerance specifications for alignment of the thread with the body of the work. The collar is ground to have a running fit within a pilot bushing which is located at the front of the machine carriage adjacent to the bushing previously mentioned and supporting the nose of the work. This pilot bushing operates in anti-friction bearings to minimize wear.

In operation, the collapsible action of the tap is actuated by the tripping collar striking the end of the work. Thus, danger of the chasers striking shoulder at bottom of work to cause breakage is eliminated, and the threads are held within close tolerance for overall length.

Production is estimated to average 90 to 115 shells per hour based on an operating efficiency of 100%.

Tapping and Drilling Heads

The diversified line of auto-reverse tapping chucks and multiple drilling heads, made by Errington Mechanical Laboratory, Staten Island, N. Y., is presented in a new bulletin.

HONEST MEN STEAL TOOLS?

No—but tools are often picked up by mistake and put into personal kits. The best insurance against such carelessness is permanent identification etched or marked on the tool itself.



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Durakool Announces New Switches

To meet the continual demand for larger electrical capacities in switches with smaller overall mechanical dimensions, Durakool, Inc., Elkhart, Ind. announces two radically new mercury switches. One bears catalog No. A-5M; the other, No A-10Z. Both have new internal construction characteristics that enable them to carry substantially greater currents than the regular Durakool Switches of the same dimensions.

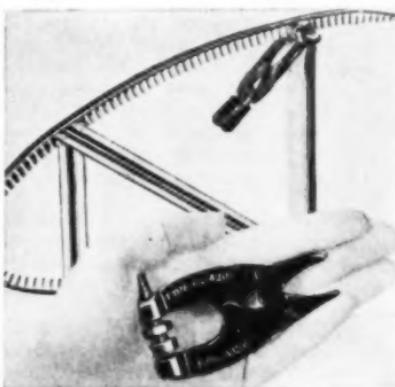
A standard A-5 is rated for 200 watts A.C. lamp load at an operating speed not to exceed 20 times per minute. The A-5M, although having the same physical dimensions, is claimed to have withstood 750,000 operations on a 500 watt A.C. lamp load at an operating speed of 5 times per minute 24 hours a day. Also 50,000 operations on a 1,000 watt D.C. lamp load at a rate of 25 times per minute. The performance of the A-10Z is equally impressive compared with a standard A-10 Durakool Switch.

The A-5M has a very small required

angular tilt for operation and maintains this angle to a remarkable degree even under heavy overload. The A-5M is especially adapted to snap acting mechanisms, as well as tilt action, where it will give a uniform performance. The A-5M, although priced only slightly higher than the standard Durakool A-5 (5 ampere switch), can be used in a great many applications which formerly required the A-10 (10 ampere switch). Similarly, the A-10Z, at a slight increase in price over the A-10, can be used on many applications where formerly the capacity of the A-10 itself was not enough and the much larger physical dimensioned A-20 (20 ampere switch) was required.

Midget Toggle Plier

Knu-Vise, Inc., 16841 Hamilton Ave., Highland Park, Mich., announces a new midget toggle plier, designed and developed especially for the aircraft industry.



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WORK WANTED

Recent expansion of a privately owned machine shop enables it to take on additional small and medium sized lathe, drill and milling machine work.

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The overall length is a mere 2- $\frac{3}{4}$ " and the weight is 2½ ozs. It is made from 10/20 SAE steel, hardened and tempered. Though very small, the leverage obtained by pressing the two handles between finger and thumb is in excess of 90 to one, thus enabling the operator to grip small aircraft parts with a pressure far in excess of that obtained with conventional "CEE" clamps of small size. To date, they report sales of several hundred to aircraft companies on the West Coast who find them of value when clamping formed sections to the skins, and templates to sheets of aluminum when marking out same, and undoubtedly other applications will occur to users from time to time.

A New Flexoid Bulletin

The Smith Power Transmission Co., 1545 E. 23d St., Cleveland, O., announces a new folder descriptive of Flexoid Speed Control Units, for modernizing and motorizing machine tools. This is folder No. FSC-124-A, which shows various applications, and gives new and complete ratings and list prices.

Smaller and Lighter Motors

October 1st marked the beginning of a national program of motor modernization, and the first major change in the original motor dimension standards adopted by the N. E. M. A. members 12 years ago. Small a-c polyphase, single phase, and d-c motors from $\frac{3}{4}$ to 2 h.p. have been reduced in size and weight. Typical of the new compactness is the new model 1-½ h.p. squirrel cage induction motor which weighs 25% less, and occupies 27% less space than its prototypes of the same speed ratings. The motor industry agrees that the time is ripe for making these benefits available to motor users. Smaller motors can solve an old problem of machine builders—space. More power per cubic inch and per pound.

Changes in the NEMA standards affect weight, space, and size. Smaller motors are possible now because of two major improvements; silicon steels have been improved greatly until now

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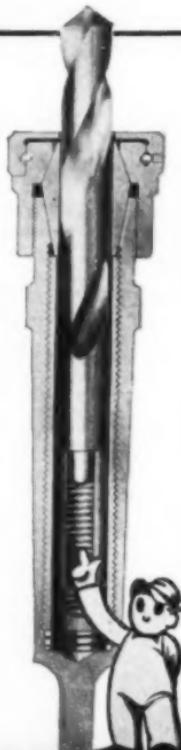
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Engineering Company
Frankenmuth, Mich.

less motor iron is necessary to produce the same power; better insulations make further reductions possible. New synthetics and new cloth insulations of higher dielectric strength have been developed which permit coil insulation, of the same quality as formerly, in a smaller space.

Westinghouse has just completed a broad program of motor re-design which covers a much wider scope of improvements than are called for by the new standards, affecting only the motors from $\frac{3}{4}$ to 2 h.p. This program affects motors in the wider range from $\frac{1}{2}$ to 3 h.p. Frame shapes have been re-designed and a new bracing structure gives them more strength. Frames have been made lighter. Ball and sleeve bearings and their housings have new type seals against dust and dirt which are far more efficient than those used on the old motors. The machine designers problem of blending motors and machines for smart appearance now demanded by industry has been met by use of smooth finish and curved lines. Sharp edges have been eliminated and all frame corners rounded.

Explanation for the standards revision forms an interesting story of industrial standardization. It harks back to electricity's early days when motors were first introduced to industry. From 1892, when Lamme of Westinghouse made the Tesla induction motor into the first practical a-c drive until 1928, industry adopted electric drives almost universally. The various motor builders, each developed his own designs and consequently many shapes and sizes for motors of the same rating came into being.

Recognizing that such a variety was having disastrous effects on the cost of applying and maintaining motors on machines, both in engineering time on the part of the machinery builder, and in troubles and delays caused the motor user, due to lack of interchangeable replacements, motor manufacturers through NEMA worked with customer industry groups, and adopted standard motor mounting dimensions during the latter part of 1928.

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Boring mill, 94" vertical, 68" table, 2 heads.
Drill and tapper, 32" Hoefer sliding head.
Folders, Niagara power, 45" and 72".
Grinder, 7" x 30" Morse plain, cylindrical.
Iron planers, 32" x 8", 36" x 9", 50" x 16".
Iron planer, 48" x 16" 2 heads and motor.
Lag screw pointer, Pawtucket, collets 1" and 1½".
Lathes, 16" x 9", 20" x 12" and 24" x 12", quick change.
Power punch, 36" throat, architectural jaw 1" in 1".
Spur gear cutter, 36" Becker automatic.
Turret lathe, 30" Gis, cone type, large 4 jaw ind. ch.

Fuchs Machinery & Supply Co.
1102-4 Farnam St. Omaha, Nebraska

Automatic, No. 19 Brown & Sharpe, m. d. many tools.
Broach, No. 38 La Pointe.
Compressor, 12x10 Ing Rand 355' ERI.
Drill, 2 spdl. Henry-Wright, 15" overhang.
Drill, 3" American radial, s. p. d.
Flanger, No. 407 Niagara, combination circle shear
and flanger, several sets flanging rolls, motor drive,
220-3-60, like new.
Grinder, No. 17 Besley disc, belt drive.
Grinder, Micro internal cylinder, m. d.
Lathe, 13x1 South Bend, l. c. cone.
Lathe, 14x10 Sidney, q. c., d. b. g., t. a., cone.
Lathe, 14x10 Monarch, q. c., cone.
Lathe, 16x7 South Bend, q. c., cone, m. d.
Lathe, 15x5 American, q. c., cone, m. d.
Lathe, 30" x 17" Lodge & Shipley, q. c.
Lathe, No. 2 Bardona Oliver, turret.
Lathe, 21" Gisholt turret, 24" hole.
Press, No. 54 DAG Ferracute, d. a. cam.
Planer, 36x36x10 Niles, belt drive.
Shear, No. 9126B Niagara, 10", 8" 18" gap.
Shear, and flanger, No. 407 Niagara, 18".
Slotted, 10" Putnam, 27" table.
Slotted, No. 1 Manville screw slotted.

FOR SALE BY

The Elyria Belting & Machinery Co.
Elyria

A BARGAIN ONCE IN A LIFETIME

Unbreakable New Machinists' Vises.

Made entirely of drop-forged steel.

Only a limited number left.

3" swivel \$8.50. 3" stationary \$4.50.

4½" swivel \$7.75. 5" stationary \$7.50.

Write for circular.

R. S. Armstrong & Bro. Co.

676 Marietta St., N. W., - Atlanta, Ga.

Bolt threading machines, b. d., 1½" National, 2" Landis.
Compressor, 9x8 1-R, horz., b. d.
Compressor, 10x10 C.P.T., horz., b. d.
Compressor, 12x10, 1-R, horizontal, b. d.
Drill presses, b. d., 28" Barnes, Norton and Aurora.
Grinders, pl., cyl., 10" x 20" Landis, 6" x 32" Norton.
Hammer, 21 lb. Little Giant, power, b. d.
Keyseaters, No. 2 Davis, m. d. No. 2 M. & M., b. d.
Lathe, 20" x 28" American, QCG, cone drive, rebuilt.
Lathe, 18" x 16" Lodge & Shipley, open grd., hd., m. d., t. a.
Millers, plain, b. d. No. 2 and No. 4 Kempsmith, No. 19 Valley City.
Pipe machine, Curtis & Curtis, 2½" to 8".
Radial drill, 4" Western Lo-Hung, m. d., pract. new.
Shaper, 24" Cincinnati, b. d., rebuilt.
Shear, Thompson bevel patch
Shear, No. 2 Bethlehem circle, b. d.
Universal Woodworker, Northfield.

Wm. C. Johnson & Sons Machy. Co.
1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Bolt threaders, 1", 1½" & 2" Acme.
Boring machine, 14" Betts.
Boring mills, 6"-8", 44" Niles.
Boring mill, King 34", turret head.
Broach, 3A La Pointe of Hudson.
Drill, Natco 15 spindle. No. 1 taper.
Drill, No. 2 Fox, 6 spindles.
Drill, Moline hole hog, 5-sp. No. 4 Morse taper.
Drill, radial, 4" Fosdick; 3½" Mueller, 3" Reed-Prentice.
Drill, radial, 3" Cincinnati Bickford.
Drills, radial, Drillmaster, new.
Gear hobber, No. 3 Adams.
Grinders, 16" x 30" and 6" x 18" Landis.
Hammers, 300 lb. Beaudry, 75 lb. Bradley, 50 & 100 lb.
Little Giant.
Lathes, 16" x 6" Greaves Klusman, q. c. g.
Lathes, 20" x 10" Cisco, g. h., t. a., like new.
Lathes, 22" x 12" United States, q. c. g.
Lathe, 32" x 14" Schumacher & Boye.
Lathe, 42" x 15" Fifeeld.
Miller, Ctn. production type, 57" x 11" table.
Miller, No. 19 American.
Pipe machines, 2"-4"-6"-8"-12".
Pipe machine, 3" Landis.
Planer, 30" x 30" x 14" Cincinnati.
Press, 92B Toledo double crank.
Presses, Nos. 2, 3 & 4 Marshalltown.
Presses, 3, hydraulic pump & accumulator.
Roll, plate straightening, H. & J. No. 2, like new.
Shapers, 12"-16"-20"-24".
Shaper, 24" Columbia, motor driven.
Punches, shears, bulldozers.
Testing machine, 100,000 lb. Riehle.
Toggle press, 40 T.A. Bliss.
Large stock guaranteed electric motors. Any size.

USED AND REBUILT MACHINERY

FOR SALE BY

Behlen Machinery Co.
4744 Twelfth Street, - Detroit, Mich.
Telephone 1-6754

Bolt and pipe threaders.
 Brake, 814 D. & K.
 Drills, Avey, Edlund, Fosdick, Cinc., Natco, 3-way.
 Grinders, No. 2 B. & S.; No. 3 B. & S. univ.; m. d.;
 No. 13 B. & S. univ.; 10x24 Landis self-contained;
 Head 8" rotary; No. 19-52 Besley.
 Lathes, 16x8 Reed l. c. taper, m. d.
 Springfield 14x6 s. q. c., m. d.
 Mills, Sundstrand h. d. hand; 8" P. & W. Auto. K. O.
 Auto.
 Shapers, 24" Gould & Eberhardt, m. d.
 Shears, 52 Stoll.
 Sleeve machine, Stolp, new.
 Welder, 35 K. W. Thompson, proj. type.
 G. & E. No. 12, s. o., m. d.

FOR SALE BY

Factory & Mill Supply Co., Inc.
176 Federal St., - Boston, Mass.
 Hammer, 500 pound Bradley, helve \$ 500
 Lathe, 42" raised to swing 52"x22", Putnam 1200
 Planer, 48"x48"x8" Putnam, two heads 1500
 Shears, Beloit, No. 27, splitting 300

Alex Zeeve

2280 Woolworth Bldg., New York, N. Y.
 Drills, radial, 4" Dieses, gear-box, m. d., box table; 4"
 Fosdick, gear-box, s. p. d.
 Keyseater, No. 6A Mitta & Merrill, arranged m. d.
 Lathe, engine, 53" x34" Nicholson-Waterman, geared
 faceplate, taper: 24"x16" Whitcomb-Blaidsell q. c.,
 d. b. g., taper; others.
 Planer, 36"x36"x10' Pond, 4 heads, b. d.
 Plate planer, 20' Hilles & Jones No. 3, m. d., 2 car.

Marr-Galbreath Machinery Company

Air comp., 8x6" Gardner duplex m. d.
 Air comp., 676 cu. ft. Ing-Rand, XRE. 3/60/440.
 Ball or jar mill, 2-jars 10x12", belt or m. d.
 Blowers, (furnace) No. 2 Knight; No. 3 American.
 Blower, pressure, No. 11/2 PH Am. 14375 cfm., m. d.
 Bolt cutter, 14" Landis, sgl. head.
 Boring mill, 120" Bettis, 2 hds., m. d.
 Boring mill, 30" Ballard vert. threading attach., b. d.
 Boring mill, 84" Pond, 2-hds. Fctn. feed, c. s.
 Brakes, hand, 4' Keene, 18 ga.
 Brakes, hand, 4' 12 ga. Chicago, power, belted.
 Brake, crimp and corrugating, 16"x16 ga. Keene.
 Die filing machine, No. 2 Cochran-Bly.
 Die machine, 25 ton Henry & Wright, (near new)
 Driller, horiz., 6 spindle Nat'l. Acme, No. 2 chucks.
 Drills, radial, 2" & 3" Dresses, Simplex, cone.
 Drill, 22" Champion, b. g., p. f., m. d.
 Drills, gang, 3 and 4 spindle, 1 to 4 MT.
 Exhaustor, No. 35 Buffalo, outlet 12x14", m. d.
 Fan, ventilating, 24" American, m. d., 1/60.
 Forging machines, 1" Ajax, 4" National.
 Forging machine, 16" Acme, all steel, side shear.
 Gear pinion, No. 3 Sloan & Chase, auto. bench.
 Grinder, No. 2 Grand Rapids Tool.
 Grinder, drill, 24" Oliver, m. d.
 Grinder, No. 12 Besley, double end disc.
 Grinder, No. 21 Landis, plain, 10x30", c. s.
 Grinder, portable surface, No. 6 OA, motor, 3/60.
 Grinder, univ. C. & R. No. 3 B. & S.
 Grinding spindle, Excello No. 39, bracket 5002.
 Hack saws, No. 7 & 10 Atkins, belted.
 Hammers, 50 lb. Boss, No. 2, with dies, belted.
 Hammer, 2500 lb. Erie, Arch frame, steam.
 Hammer, 3000 lb. Chbg, steam forging.
 Hammer, 3000 lb. dble. frame, steam.
 Hammer, 400 lb. Bliss board drop (rebuilt).
 Hammer, 1000 lb. Chbg, steam drop, double frame.
 Hoists, 1 to 14-ton hand chain.
 Hoists, Canton No. 1 portable.
 Hoists, 10-ton Euclid, 3/60/220 (2).
 Keyseater, Morton, cap. 24"x24", s. p. d.
 Lathe, 11 1/16"x4" Artisan, o. c. g., s. p. d.
 Lathe, 14"x6" Mulliner-Edlund, q. c. g., t. a.
 Lathe, 14"x8" P. & W., taper att., cone.
 Lathe, 15"x8" C. & J., geared head, m. d., t. a.
 Lathe, 26"x16" Pittsburgh, s. c. g., cone.
 Lathe, roll, 44" Hyde Park, m. d.
 Lathe, 36"x39" Springfield, m. d., 230 v. d. c.
 Marking machine, No. 3 Noble & Westbrook.
 Milling machine, No. 1 Cleveland plain, s. p. d.
 Miller, mfg. type, Kempham, table 44"x12".
 Motors, 15 h. p., West. 3/60/220-440/870 rev.
 Motors, 25 h. p., Allis-Chalmers 3/60/220/680 rev.

57 Water St.,

Pittsburgh, Pa.

Motors, 30 & 40 h.p., West., CS. 3/60/220/870 rev.
 Nailing machine, No. 6 Morgan, 8-track, m. d.
 Nibbling machine, No. 1 Campbell, 6" thr. 3/16".
 Nibbling mach., Gray 30" thi., cap. 3/16", m. d.
 Pinion cutter, No. 3 Sloan & Chase, capacity 1x1".
 Pipe machine, 8" to 12" Jarecki, belted.
 Pipe machine, 4" Williams, cap. 4" to 4", m. d.
 Pipe machine, 6" Jarecki, cone or m. d.
 Pipe machine, 18" Wieand "Standard", m. d.
 Planer, 26"x28"x8" Niles, 1 hd., belt m. d.
 Press, arbor, 42" Weaver, hand.
 Press, foot, Lewthwaite, wt. 400 lb., (4).
 Press, horn, No. 16A Bias, plain, stroke 14".
 Press, 4A, Bliss horning, stroke 4".
 Press, P-3 Ferracute, 14" stroke, m. d.
 Press, o. b. i., bench, No. 100-B Perkins.
 Press, agl. crank, 58" Toledo, str. 8".
 Punch, S.E., 36" Cleve. E.F. 1x1", A.J., dies.
 Punches, c. e., 36", 48", 60" cap., H" x1", m. d.
 Punch & shr., comb., No. 5 Buffalo, hand, cap. 4" x2".
 Punch & shear, S. E., 6" th. No. 3 L. & A., raviu. u.
 Riveter, No. 5-A, high speed, cap. 4", m. d.
 Riveter, 103 Grant, m. d., 2/60/220 v., cap. 5/16".
 Rolls, bending, 37x24" D.E. Bertsch & P.S. & W. 18 ga.
 Rolls, 5x12" Bertsch, initial solid hgs., b. d.
 Rolls, bending, 8x12" Bertsch, d. e.
 Rolls, 30"x6" United, 2-rolls (for leather).
 Saws, metal, 4x4" Napier, m. d.
 Shaper, 15" Blount, single geared.
 Shaper, comb., 7" Rhodes, horiz. 3/8" vert. str.
 Shaper, 20" G. & E., B. G. crank, cone.
 Shaper, 20" Columbia b. g. crank, gear box, s. p. d.
 Shear, bar, No. 3 United, 24" blade, cap. 3" x2", m. d.
 Shear, Billet, cap. 60"x2", m. d.
 Shear, 60"x8" L. & A., 5" gap, m. d.
 Shear, Blocks & Blades 52"x8" cap. 1500 lb.
 Shear, rotary No. 2 Standard 19 ga., b. d.
 Shear, square, 8"x18 ga., P. S. & W., foot power. (new).
 Shear, B-36 Stanley Unisharp, cap. 4", m. d.
 Shear, O-36 Stanley Unisharp, cap. 14 ga., m. d.
 Straightener, bar, 24" cap., motor 3/60/220.
 Straightening rolls, Cleveland 60"x12", m. d.
 Tapping machine, 1" Pratt & Whitney, b. d.
 Testing machine, 1000 lb. Olsen hyd., hand.
 Tearing machines, 1000 lb. Economy, hand power.
 Transmission, Reeves No. 00-E. (new)
 Turbines, 100 h. p. Westinghouse, 900 rev.
 Turret lathe, 18"x6" Springfield, Fox Monitor.
 Turret-screw machine, 14"x15" P. & W.
 Upsetter, 12" Acme, all steel.
 Welder, arc, 160 amps, a. c., (near new) (2).
 Welder, arc, 280 amp., a. c. Hampton (new).

USED AND REBUILT MACHINERY FOR SALE BY

General Blower Company

401 N. Peoria St., - Chicago, Ill.
BLOWERS—FANS—EXHAUSTERS.
 For Dust Collecting—Ventilating.
 Oil and gas burners, cupolas, furnaces, etc.
 Roots—Conversville and centrifugal blowers.
 What are your blower requirements?

C. R. Daniels

1514 W. Capitol Drive, Milwaukee, Wis.

Air compressor, 10x12 Ingersoll Rand.
 Boring mill, 96", Niles, vertical, cone drive.
 Broach, La Pointe No. 3, belt drive.
 Welder, 200 amp. Lincoln, portable engine driven.
 Welder, 300 amp. P-H, portable engine driven.

Davis Machinery Company

1-3-5 So. St. Clair St., Toledo, Ohio

Brake, 4"x12" Chicago, power, leaf type, m. d.
 Grinder, Union Hob, motor driven.
 Grinder, No. 2 W. & M., surface, belt drive.
 Grinder, No. 2 Bath universal, with attachments.
 Lathe, 26" x 48" x 18 McCabe 2 in 1.
 Lathe, 21x8" LeBlond hy. duty, q. c. g.
 Lathe, 20"x12" Whitcomb-Blaudell.
 Mill, boring, 32" Colburn vertical.
 Press, No. 75 Toledo open back, geared.
 Shaper, 34" G. & E. crank, back geared.

Jones Machine Tool Company

Front & Pike Sta., Cincinnati, Ohio

LATHES

38x12" Boyce & E. q. c.	motor in leg.
36x14" Boyce & E. c. d.	18x10" Mueller, q. c.
24x14" Boyce & E. q. c.	18x10" Hendey, q. c.
24x12" Boyce & E., q. c.	16x8 L. & S. 8 step, c. d.
20x18" Sebastian grd., h.	

MILLERS & GRINDERS

No. 3-B Owen pl. miller.
 No. 2 hvy. B.-S., pl. c.d.

PRESSES

No. 6-H Toledo, incl.	No. 56 Toledo, sgl. crk.
No. 17 Stoll, inclinable.	Ferracute double crank, 36" bet. uprights.
No. 5 Toledo, inclinable.	No. 65 Mich. s.s. ngl. ck.
No. C-5 Ferracute incl.	No. 160 Cona. str. aided double crank.
No. 25 Niagara arch.	
Mich. s. s. dble. c. 72" between upr.	

SHEARS

No. 65 Nta. circle shear.	72" Niagara foot power, 22" gap.
42" Pexto, foot an. 16 ga.	48"x16 ga. shear, 12" gap.
36" & 43" Power shear.	

MISCELLANEOUS

10"-10 G. Ohl Pr. Brake.	42" Niles vertical boring mill, 3 heads, s. p. d.
No. 253 D. & K. Press Brake, 37" bet. housings, m. d.	No. 1 LeBlond Tool and Cutter Grinder.
52" Verson Press Brake, m. d.	3" Acme Bolt Cutter.
No. 5063 D. & K. Press Brake, 8", 6" bet. housings, m. d.	No. 4 Mittie & M. Keys.
Planer, 24x6 Gray, Ohio 1 head.	4" Landis, 6" Williams Pipe Cutter.
Ingersoll Tab Grinder, No. 2, 3 & 4 Landis univ. cyl. grinders.	Hack Saws, Racine and Peerless.
	Shapers, 24", 20" and 16" various makes.
	Gridley auto., 18", 4-spdl. Rolls, 3-C Beloit 50"x 3/16" cap.

FOR SALE BY

Nelson Machinery Co., Green Bay, Wis.

Drill, 5 ft. Bickford No. 2 radial, geared m. d.
 Drill, 28" sliding hd.—H. W. L. & G. P. F.—belted.
 Grinder, Cochran Bly No. II S auto. saw, cap. 10" to 32".
 Grinder, Niles-R.P. 12x36 Universal Mfg., belted.
 Hobber, Barber Colman No. 12.

Bleser Machinery Company

209 N. Sixteenth St., - Springfield, Ill.

Air compressor, auto. unit, 5 h. p.	\$150
Drill presses, 20" to 34".	
Lathe, 15"x8" LeBlond, q. c., t. a.	360
Hammer, power trip, 25 lb. Little Giant.	75
Press, punch, 14" stroke.	85

Wiener Machinery Co.

237 Centre St., - New York City

Bevel gear generator, 16" Gleason, m. d.
 Hack saw, 6x6 Racine shear cut, m. d.
 Lathe, 20"x18" Reed, q. c., instant motor drive.
 Mill, No. 5 Cincinnati, h. p., pl., s. p. d., slotted nose.
 Shaper, 16" Gould & Eberhardt, b. g.

Michael F. O'Malley

102 Olive Street, Scranton, Pa.

Turret lathes, Warner & Swasey, with all equip., (2).
 Turret lathes, Garvin Machine Co., (2).
 Turret machine, Dreses, with turn, tables, comp., (1).
 Turret lathe, Pratt & Whitney, (1).
 All machines re-built and in good condition.

Bradley Machinery Co.

529 E. Jefferson Ave., Detroit, Mich.

A FEW ITEMS (PRICED) FROM OUR STOCK
 Air compressor, Bury, 10x10.
 Automatic, New Britain, 6 spindle, 1"x5" \$1250
 Automatics, New Britain,
 1-1/2x7 New Britain,
 1"x5".
 Automatics, Brown & Sharpe.
 Bar shear, Doty (new). 350
 Broach, No. 3 La Pointe.
 Cam cutter, Garvin.
 Generator, cam Garvin.
 Drill radial, 5" Cincinnati Bickford. 1350
 Drills, 6 spindle, 2 spindle and single spindle 600
 Gear hobber, G. & E., 16".
 Gear cutter, 18H G & E.
 Grinder, 12x72 Brown & Sharpe, plain. 650
 Grinder, 10x52 Norton 750
 Lathes, 24x10, m. d., South Bend, with taper attach.
 Miller, Hendey production type.
 Miller, No. 1/2 B Milwaukee.
 Miller, No. 2 Pratt & Whitney.
 Press, P-3 Ferracute. 250
 Turret lathe, No. 1/2 B. & O. 200
 No. 4 Warner & Swasey.
 No. 6 Warner & Swasey.
 Turret lathes, No. 6 Warner & Swasey.
 Turret lathes, No. 4 Warner & Swasey.
 Turret lathe, Acme.
 Turret lathe, 2x4 O. & L.
 Hundreds of other items priced low.

USED AND REBUILT MACHINERY

FOR SALE BY

Faior-Strafer Machinery Co.

132 Liberty St., - - New York, N. Y.

Automatic, 5^{1/2}" Model A Cleveland, motor drive.
 Blue print machine, Paragon, type B, size 42, m. d.
 Boring mill, 36" Bullard New Era 1 tur. hd., 1 side hd.
 Boring mill, 34" Bullard D. & H., horiz. floor type.
 Drill radial, Amer. 3" sens., tapping attachment.
 Drills, radials, 3" Cincinnati-Bickford & 3" Mueller.
 Drill, radial, 6" N. B. P. full univ. arr. m. d.
 Gas furnace, No. 4 American, door opening 8"x14".
 Grinder, Oliver 4 wheel wood tool grinder.
 Grinder, 10"x24" Landis pl., self-contained, m. d.
 Lathes, turret, 24" & 28 arr. for bar work & arr. chuck.
 Lathe, 26" x10" W. Alcott, 3 step cone, d. b. g.
 Lathe, 13"x6" Willard, 3 step cone, d. b. g.
 Lathe, 18"x8" American, modern, 3 step cone, d. b. g.
 Pipe machines, 6" Wieland, " Williams, m. d.
 Planer, 45"x48"x18" Powell, 4 hds., box table, fine cond.
 Shears, squaring 12"x3/16" Ohio.
 Shear, squaring 10"x3/16" Loy & Nawrath, arr. m. d.

FOR SALE BY

Russell Machine Co.

438 Oliver Bldg.**Pittsburgh, Pa.**

Boring mill, 42" Gisholt, 2 heads., m. d.
 Boring mill, 10" Niles vertical.
 Boring mill, 62" Bullard 2 hds. grd. feeds, m. d.
 Drill, radial, 6" American triple purpose.
 Gear cutter, 36" Brown & Sharpe.
 Hammer, 1500 lb. Bliss board drop.
 Hammer, No. 2500 dbl. frame Chambersburg steam.
 48" Morton Keyway cutter, cap. 3^{1/2}" wide.
 Lathe, 20"x10" Hendey, q. c. g.
 Lathe, turret, 28"x26" Pratt & Whitney, g. h. b. d.
 Pipe cutting and threading machine 6" Merrill.
 Press, hyd. wheel, 100 ton Caldwell.
 Punch, multiple, No. 68 H & J.
 Shaper, 24" Columbia, d. b. g. gear box, m. d.
 Shear, Alligator, No. 61 Carlin high knife, 24" sq.
 Straightener, No. 1 Schuster flat strip metal, m. d.
 Straightener, No. 1 Kane & Roach, cap. 4" rd.
 Upsetting machines, 24", 34", 4 and 5" Ajax iron bed.

Lang Machinery Company

28th St. & A. V. R. R.

Pittsburgh, Pa.

Air compressors, Ingersoll-Rand XB-2, 600, 888, 1200 & 1500 cu. ft. 100 lb. pressure, motor drive.
 Air comp., WJ-3 Sullivan, angle comp., 468 c. f.
 Air comp., 14"x12" Ing. Raad "ER-1", 464 c. f.
 Bolt cutter, 1" Landis, 14" 3" Acme, sgl. hd., b. d.
 Bolt cutters, 1" Acme, Landis hds., 2 & 3 spdl.
 Bolt cutter, 2" Acme, Landis' head, b. g. b. d.
 Boring mill, 30" Bullard, threading attach., s. p. d.
 Boring mill, 42" Bullard, 2 swivel heads, s. p. d.
 Boring mill, 42" Gisholt, 2 hds., r. p. t., m. d.
 Boring mill, 42" Colburn, grd. hds. 2 hds., s. p. d.
 Boring mills, 42" and 52" King, r. p. t., m. d.
 Boring mill, 52" N. B. P., 2 heads, m. d.
 Boring mill, 52" Bausch, geared feed, d. c. m. d.
 Boring mill, 62" Bullard, 2 heads, grd. feed, m. d.
 Boring mill, 72" Niles, 2 heads, fric. feed, b. d.
 Boring mill, 96" Niles, 2 heads, b. d.
 Boring mill, 10" Niles, 2 heads, belt drive.
 Boring mill, 10"-16" Betts, b. d.
 Boring mill, 18" bar Binsee, knee type.
 Boring mill, horiz. 38" bar D & H, floor type.
 Boring mill, horiz. 69" bar Niles, floor type.
 Brakes, power, 8" 12 ga., D. & K., leaf type, b. d.
 Buffer and polisher, 79 h. p. Marschke, 220/3/60.
 Drill, radial 6" Amer. triple purpose, 16" col., m. d.
 Drills, upright, 14" to 32", beltdrive.
 Drill, No. 3 Avery-std., 12" o. b. b. d.
 Drill, upright 36" Snyder, p. f., b. d.
 Drills, 4-spdl. Avery No. 2 M. T. b. b. m. d.
 Gear cutter, 48"x12" Gould & Eberhardt, s. p. d.
 Gear hobber, No. 12 Barber Colman, s. p. d.
 Grinder, No. 51 Oliver drill, m. d.
 Grinder, Dillon dbl. end, 72 h. p., 220/3/60/1750 r. p. m.
 Grinder, disc, 18" Diamond, dbl. end.
 Grinder, No. 5 G & L, hydro. feed, m. d.
 Hammer, 30-lb. Bradley upright strap.
 Hammer, 100-lb. Bradley cushion helve. belt drive.
 Hammer, power, 300-lb. Bradley upright helve.
 Hammer, power, No. 4 Beaudry, b. d.
 Hammers, steam drop, 1000-lb. to 8000-lbs.
 Keyseater, Davis, cap. 1" belt drive.
 Keyseaters, M. & M. No. 4-24", No. 5-34".
 Keyseater, No. 2 Baker, str. 24", cap. 27", b. d.
 Keyseater, No. 34" Baker, stroke, 24", m. d.
 Lathe, 12"x6" Prentice, geared head, q. c. g., s. p. d.
 Lathe, 18"x10" Hendey geared head, t. a., m. d.
 Lathe, 24"x10" Bradford, q. c. g., t. a., b. d.
 Lathe, 24"x14" Lodge & Shipley, q. c. g. d. b. g., b. d.
 Lathe, 28"x14" Schumacher & Boye, p. c. g., t. a., b. d.
 Lathe, 36"x18" American, p. c. g., t. a., b. d.
 Lathe, 36"x26" 6" New Haven, p. c. g., b. d.

Lathe, 40"x16" Fifield, trip. grd., int. face plate dr.
 Lathe, 42"x20" Springfield trip. grd., p. c. g. b. d.
 Lathe, 51"x32" New Haven, triple geared, motor drive.
 Lathe, turret, No. 2 Warner & Swasey, b. d., (2).
 Lathe, turret, 24"x26" Pratt & Whit., grd. hd., s. p. d.
 Miller, duplex, 36"x10" Ingersoll, m. d.
 Miller, plain, No. 3 Cincinnati, b. d.
 Miller, univ. No. 3 Garvin, div. head, b. d.
 Miller, rotary 72" Ingersoll, m. d.
 Pipe machines, Landis 4" to 2", belt drive, (2).
 Pipe machines, No. 304-B, Oster, m. d.
 Pipe machines, 6" Landis gear box a. c., m. d.
 Pipe machine, No. 308-B Oster, m. d.
 Pipe machines, 8" Williams, 23" to 8" motor drive.
 Planer, openside, 36"x16"x12" Cleveland, 3 hds. m. d.
 Planer, 36"x36" 11" Sellers, 2 heads, b. d.
 Planer, 56"x16" Gray, 3 heads, m. d.
 Press, arch, No. 52 Toledo, str. 44", m. d.
 Press, baling, 13-P Logemann hydraulic, m. d.
 Press, coining, ELG, 4 Ferracute.
 Press, P-3 Ferracute, stroke 18".
 Press, dbl. crank, Stoll 79-D, 72"x26" m. d.
 Press, No. 95 Bliss, dbl. crk., str. 34" m. d.
 Press, No. 18 Bliss o. b. i. str. 15" d. f., flywheel type.
 Press, No. 5 Toledo o. b. i. str. 2" flywheel type.
 Press, toggle, Garrison 500 ton, bed, 48"x60".
 Press, trimming, No. 2 Billings & Spencer, 80 tons.
 Press 300 ton W-S-M Hyd. Tire. betw. uprs. 44", b. d.
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 Pump, Aldrich triplex, 75 gal. 2000 l. b. m. d.
 Punch & S., Cleveland, 36" thrt. 14"-1", m. d.
 Punch, lever, No. 58 Niagara, 36" throat.
 Riveting hammer, No. 54B high speed, m. d.
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 Saw, band Type M Laidlaw, cap. 6", m. d.
 Screw machine, No. 52 National Acme, s. p. d.
 Shapers, 16", 20", 24" & 28", belt or motor drive.
 Shaper, 20" Stockbridge, p. d. f., b. g. m. d.
 Shaper, 24" Columbia, d. b. g., gear box, m. d.
 Shear, alligator, No. 61 Carlin, 3" round high knife.
 Shear, Alligator, No. 7 United Eng. & Fdy. Co.
 Shear, squaring, No. 862 Niagara, cap. 62"x16", b. d.
 Shear, squaring, No. 6 E Niagara, cap. 72"x14", m. d.
 Shear, rotary, No. 10 Quickwork, 14 ga. 60" throat.
 Slotter, 8" Betts, table 20" dia. b. d.
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Miller, No. 4 Cincinnati plain, high power, cone.
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Air compressors, 139 and 450 cu. ft.
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Hammers, 50 lb. Mayer upright, m. d.
Miller, hand, No. 1 U. S.
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Press, horning, No. 40 Bliss.
Press, No. 82-C Toledo dbl. crank, 5" shaft, 44" wide.
Press, No. 94-A Toledo dbl. crank, 6" shaft, 6" stroke,
46" wide.
Roller leveler, 54" 17-44" rolls, m. d.
Shapers, 16" & 24" b. g. crank.
Shear, plate, 100" Toledo, 4" plate, m. d.
Shear, plate, 96" x12" Toledo, m. d.
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Slotted, 15" Bement, crank, 36" rot. table.

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No. 7 Bliss, double crank, tie rod, 45", crank 7"-8".
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No. 65 E Niagara, gap, grd., double crank, 72".
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No. SG 107 Ferracute, dbl. crank, 96", crank 54".
Nos. 93B and 91C, Toledo double crank presses.
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No. 55 Niagara, geared, straight side.
Nos. 54, 55, 55A, 56 Toledo, geared straight side.
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No. 1644 Toledo toggle, press.
Nos. PA1 Ferracute & 13 Toledo horning.
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75 ton EG51 Ferracute.
500 ton American Can Coining, 75t. No. E51. Ferracute.
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All machines in A1 shape.

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Gear hobber, No. 1 Adams Farwell.
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Surplus machines in our shop priced for quick sale,

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Air compr. portable gas 1-R 100 cu. ft.
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Press, screw, No. 87 Niagara, hand power.	
Press, arch, No. 30 Bliss, roll feed, b.d.	
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Punch, comb., No. 12 Badger, 4"-4; 14" round.	
Punch, K.F. Cleveland, 36" throat, 14" thru 1".	
Punch, multiple, 32E W. & W. 10' 2".	
Punch, horiz. No. 7 Kling, m. d., 220/3/60.	
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Rolling mill, cold 6" x 18" motor drive.	
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Saw, cold, 48" Newton motor drive.	
Shapers, 16", 20", 24" & 26" Gould & Eberhardt.	
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Shear, Angle 62x6" Long & Allstatter, m. d.	
Shear, Niagara 42"x14 ga., belt drive.	
Shear, Niagara 42"x10 ga., belt drive.	
Shear, No. 162 Niagara, 62"x18 ga., b. d.	
Shear, Stoll 60" x 3/16", motor drive.	
Shear, 8"x14 ga. O.H.I. m. d., 110/220/16/60.	
Shear, 10" x 18 ga. Niagara, b. d.	
Shear, plate, 48"x3" Ironton, 24" gap, m. d.	
Shear, circle, No. 3 Bliss, 40"x20 gauge.	
Shear, guill., No. 2 H. & J. 24" rd. b. d.	
Shear, 10"x4" Bliss holdown, b. d.	
Shear, plate, 96"x4" Toledo, m. d.	
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Slitter, gang, 26" Voder motor drive.	
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Straightener, 24" Arno Loose, m. d.	
Straightener, 12"x1" Shuster, b. d.	
Straightener, 12"x1" Shuster, b. d.	
Straightener, AS & T P 12"x3/16", belt drive.	
Straightener, 48" Aetna-Standard, 17 rolls 31", m. d.	
Straightener, 60" McKay, 17 rolls 31", m. d.	
Straightener, 60" McKay, 17 rolls 31", m. d.	
Straightener, 84" McKay, 17 rolls 31", m. d.	
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Welder, spot, 13 K. V. A.	
Welder, arc, 300 amp. Lincoln.	

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Mill, Boring, Rogers, 30" vertical swing approx. 36", T & L pulley.
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36"x36"x16-6" bed, Gray, 2 heads on
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 26"x26"x6", Hamilton, 1 head on cross
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Lathe, 26"x12 ft. Bridgeford, quick change
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 Drill Press, 26" Baker, heavy duty, No. 4
 Taper, 4-step cone for 3" belt.
 Pipe Threader, Cox & Son, 2" to 8" cap,
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FOR SALE — GOOD TOOLS

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Automatic, No. 0 B. & S.	\$1,150.
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swivel heads on rail, Serial 5495,	\$1,500.
Lathe, 13 ¹ / ₂ , 15 ¹ / ₂ & 16 ¹ / ₂ x5 ¹ / ₂ & 6", g. c. m. d. with	
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Lathe, 12 ¹ / ₂ " Carron-J. S.Q.C. Fair.	\$125.
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245 cu. ft. 10'x10'. Ingers.-R.
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528 cu. ft. 14'x12'. Ingers.-R.
Class ER-1 M.D., 100 lbs Pr.

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Logemann Scrap Baler Model 20-P.
P. Box 26" x 12" x 11". Bale
11" x 14" x 4"

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10" Bertsch Initial Type, Motor
Driven Capacity 11" Plate
10" Kiling, M.D. Capacity 1"
20" Niles, M.D. Capacity 1"
BORING MILLS—VERTICAL
48" Gisholt, M.D., 1 Swivel Hd.
1 Turret Head
52" Gisholt, M.D., 2 Swivel Hds.
72" Gisholt, M.D., Ten Feed
Changes in All Directions
90" Pond, M.D., Two Pl. Swiv.
Heads Q. C. Gear Feeds

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6" D.K. "Chicago" No. 167
Motor Driven, Capacity 1"

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8'6" Loy & New, M.D. Cap.
No. 10 Ga.

10" Loy & Nawrath Model No.
610, M.D. Cap. 1" over 3" Dig

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No. 7 Ajax, M.D. face of cross
head 12"x76" Stroke 16"
No. 7 Williams & White, M.D.
Face of Crosshead 16"x70".
Stroke 22"

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M.D. Face of Crosshead 34"x
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5 ton Bedford 33' 6" Span,
220/3/60 AC

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10 ton American 59"x10" Span,
220/3/60 AC

10 ton Bedford 60' Span, 220/
3/60 AC.

10 ton Shepard 75' Span, 220/
3/60 A.C.

10 ton Champion 85'11" Span,
440/3/60 AC

20 ton Morgan 62' Span, 230
Volt DC 10 ton Auxiliary

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4 ton Link Belt, 100' Span 220/
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DIEING MACHINE
25 ton Henry & Wright
FLANGING MACHINE
1" McCabe Pneumatic Flanging
Machine

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FURNACES
9000 lb. Swindell Electric Melt-

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10 ton No. 5 Heroult Slag Melting
Furnace Complete with
7500 KVA 21,000 / 3 / 60
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3 ton Pittsburgh Elec. Steel
Melt. Furn. Comp. with Trans.

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1000 lb. to 8000 lb. Cham., B.
Sp. Erie N-B-P Morgan

HAMMER—HAZEL
No. 6 NB Hazel Hammer, Arr. for
M.D.

JOGGLING MACHINE
No. 2 Morgan Plate, M.D. Cap.
to Joggle 1" Plate 42" f. edge

LATHES
New Haven Lathe, M.D. 21' Between Centers 72" Swing, with
10" Raising Block

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N-B P. Adj. Rail, 42" bet.
hours, Table 36" wide 8 1/2"
thick, 15 1/2" long bet. oil pks.

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48" x 48" x 16" Cine 2HD, M.D.
60" x 48" x 16" Liberty, Belt, M.D.
Late Model, 3 Heads

72" x 72" x 12" Putnam 3 Hd.,
M.D.

100" x 84" x 25" Pd 4-Hd., B.M.D.
PLAVER—OPEN SIDE
60" x 48" x 38" Lib., 3 Hd. M.D.

PLAVER—PLATE EDGE
16" Southwark Arr. M.D. Equip.
with Pneu. Jacks, Cap. 1" plt.

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Thomas Plate Duplicator, Table
& Punch, M.D. Cap. Punch
1 1/2" thru 1", 73" Wide x 20'
Long

Thomas Plate Duplicator, Table
& Punch, M.D. Cap. Punch
1 1/2" thru 1", 73" Wide x 13'
Long

PRESS—CORRUGATING
12" Steine Dbl. Act. Toggle, P.
M.D. Cap. No. 10 Gauge

PRESSES—HYDRAULIC

300 ton Chamberlain, Self-Cont. 4
Col. Hydro-Pneu. P. 12" Dia.
of Ram, 18" Str., 49" Bet.C.

3000 ton Wood Four Col. Forg.
Press, 36" Dia. of Ram, 24"
Str., 22"x41" Betw. Columns

PRESS—STRAIGHT SIDE
No. 96F Toledo Double Crank,
12" Str. 124" Bet. Uprights

PUNCH—BEAM
Kling Beam Punch & Cop. Mch.,
Arr. for M.D. Cap. to cope or
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to punch 6 1/2" holes thru 4"
plate; shr. 8" chan. or I-beams

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Hilles & J. No. 5, Arr. M.D.
Cap. 48 1/2" holes thru 4" or
475 tons ram pressure

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Hous., 18" Thr. M.D., Cap. to
punch 40 13/16" holes thru
1" plate. Equipment Thomas
Spac. Table 22" x 6" long

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No. 6 Beatty Dble. End, M.D.
16" Thr. Cap. Punch 1" thru 1"

No. 14 Wil. & W. Sgle. End, M.
D. Lysholm Table Cap. Punch
1 1/2" x 1" Throat 18"

Hill & J. Punch, End, Arr. M.D.
Thr. 60" Cap. Punch 2" thru
1 1/2" with Lysholm Table

Type 9" Cleve. Sgle. End, Arr.
for M.D. 12" Throat, Cap.
Punch 2" thru 1 1/2"

Lysholm Double End, M.D. 44"
Thrus. Cap. 1 1/2" thru 1 1/2" Steel

ROLL—CORRUG. CURVING
10" Bertsch Initial Type, B.D.,
Cap. 3/16" 2,66" Corrug.

ROLL—PLATE STRAIGHTEN
96" Newbold, Arr. for M.D.
Nine 1 1/4" Disc Rolls. Ca-
pacity 1 1/4" Plate

ROLLING MILLS
9" Belgian Bar Mill, Consisting
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12"x54", finishing stand 2
stands 2 high 9" x 13", 3
stands 3 high 9" x 30"

10x9" Acme Four Stand 2 High
10 1/2" x 12" E&F Sgl. St. 2 Hi.
14x42" Gar. Sgl. Stand. 2 Hi.
16" x 20" Nat. F Sgl. St. 2 Hi.
22x28" Univ. 3 High Mill com-
plete install. incl. motor

19" Morgan 8 Stand Contin.
Sheet Bar and Skelp Mill with
3 Stands of Vertical Rolls

24" Mackintosh Merch. Bar Mill.
One 3 High Stands. One 2
High Bull Head Stand

30" Morgan 3 High Bill. Mill
44" Bloom, Mill, Consist Pin-
ion Stand, Rol. Tbl. & CatchT.

SHEARS—ANGLE
4" x 4" x 1" L. & A. Dbl. Angle
Shear Arr. motor drive
6x6" x 1" Hiller & J. No. 2

SHEARS—BAR
No. 3 Hiller & Jones Guill. Type.
Arr. for M.D. Cap. Shear 3"

Round, 2-1/2" Square, 10" x 14"
Flats 6" x 6" x 1" Angles

No. 8 Beatty, M.D. Cap. 4x30"
Cold. Complete with run-out
Table 190' long

SHEARS—GATE
132" Morgan, 7 1/2" Stroke, Ca-
pacity 1 1/2" Plate

No. 6 Hiller & Jones, Arr. M.D.
Cap. 66" x 1" Plate

TESTING MACHINE
10,000 lb. Olsen Univ. M.D.

WIRE DRAWING MACHINE
No. 3 Waterb. Fl., Arr. for M.D.
Cap. 1". Equip. 3 22" blocks

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 16"x6 Greaves-Klusman Geared Head.
 18"x8 Hendey—Cone Drive Taper Attach.
 12"x5' Hendey—Cone Drive Taper Attach.
 18"x13' Lehmann Q.C.G. Fully Eq'd.
 18"x8' Lodge & Shipley Q.C.G.—C.D.
 16"x8' Bradford Q.C.G. — Cone Drive.
 14"x6' Carroll Jamieson—Q.C.G.
 9" Sundstrand Stub Lathe.

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 No. 0 B. & S. Wire Fd-Semi-Automatic.

DRILL PRESSES

- 1 to 6 Spindle—Allen, Leland-Gifford,
 Avery—Belt and Motor Drive.
 17" Canedy-Otto Sliding Head—Motor Dr.
 24" Prentice Sliding Head—B.G. Pwr. Fd.
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MILLING MACHINES

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 No. 2 B. & S. Universal—Cone Drive.

SHAPERS

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 24" American Back Geared—Cone Drive.
 24" Milwaukee Back Geared—Cone Drive.
 20" Rockford—Single Pulley Drive.
 20" Gould & Eberhardt Pwr. Fd. to Head.
 20" Steptoe Back Geared—Cone Drive.

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- No. 3A Davis Thompson dbl. end., 4-spin.
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1/2 Hardinge Bench, Collets.

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Grid. 9/16", 7/8", 11/16" Mod. G.
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2¹/<sub>2", 2¹/₂ Auto.
B. & S. Auto.—most sizes (we
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14"x6' Prentice
 14"x10' L & S, 12 speed head
 16"x6' Reed
 18"x10' Monarch, m. d. in base
 18"x10' Monarch, m. d. on head
 18"x12' American, taper
 20"x10' American, taper
 20"x14' Hendey, taper
 20"x12' L & S, 12 speed head, taper
 21"x16' LeBlond, 12 speed head, taper
 18"x12' American, taper
 24"x26' American, taper
 24"x15' Reed
 24"x18' Lodge & Shipley Pat. Head
 26"x16' Bradford, taper
 26"x18' Bettis-Br., taper, 10" hole in spdl.
 36" raised to swing 60"x20' Am. 16 sp. hd.

CONE HEAD ENGINE LATHES

14"x6' Hendey
 14"x8' American
 15"x8' Leblond
 15"x8' Sidney
 16"x6' LeBlond, taper
 16"x6' Greaves-Klusman
 16"x8' American
 16"x10' American
 16"x14' American
 16"x8' Cincinnati
 16"x8' Rockford
 16"x8' South Bend
 18"x6' Monarch
 18"x8' American
 18"x8' Hendey
 18"x8' LeBlond
 18"x8' Mueller, taper
 18"x10' Schumacher-Boye, taper
 20"x8' American
 20"x10' Davis
 20"x10' Lodge & Shipley
 21"x8' LeBlond
 21"x10' LeBlond, taper
 24"x10' Bridgeford
 24"x10' Canada
 24"x12' American
 24"x16' Schumacher-Boye
 24-48"x16' McCabe
 27"x16' Bridgeford

BORING MILLS

52" King, 2 heads, m.d., p. r. t.
 48" Cinc., 1 tur., 1 swi. hd., m.d., p.r.t.
 42" Colburn, m. d., 2 heads, p.r.t., late
 30" Gisholt, cone
 42" Gisholt, gear box
 4" bar Lucas Horizontal, m. d.
 No. 4 N-B-P Horiz., 5½" bar
 N-B-P Cyl. Borer, 12" main bar, m. d.

MILLING MACHINES

No. 2B, 3B Brown & Sharpe Plain, s.p.d.
 No. 2H Brown & Sharpe Plain, cone
 No. 2 Van Norman Duplex, belt
 No. 3 Kempsmith Plain, cone
 No. 3, 4 Cincinnati Plain, cone
 No. 13B Brown & Sharpe Plain, s.p.d.
 No. 15 Garvin Plain, cone
 No. 25 Becker Plain, cone
 No. 3 Ohio Universal, cone
 No. 2A, 4B, 5C, 6 Becker Vertical, cone
 No. 22 Garvin Vertical, s.p.d.
 No. 33 Kempsmith Production, s.p.d.
 48" Cinc. Pl. Auto., worm dr., m.d., wide
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 48" Oesterlein Tilt. Offset, m.d., Timken
 Bearings
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 vertical spindles, m. d., very late type
 36"x36"x8' Ingerson Combined Vertical &
 Horizontal, belt
 C66A Newton 3 spindle Continuous, s.p.d.
 Gooley & Edlund Briggs Type
 No. 6 Whitney Hand, belt

RADIAL DRILLS

3' American Sensitive
 3' Carlton Sensitive
 3½' Fosdick Plain, gear box
 4' Dresses Plain, gear box
 4' Hammond Jack Knife
 5' American Triple Geared, gear box
 5' Bickford Plain, d.c. drive
 4', 5', 6' N-B-P Semi-Univ.
 5' Dresses Plain, gear box
 5' Prentiss Plain, cone
 7' Fosdick Plain, cone

SAWS

No. 2B Cochran-Bly Cold Saw
 No. 15 Lea Simplex Cold Saw
 6" Avey Milband Cutting-off
 6x6" Racine Hack Saw
 No. 20C Racine Shear Cut
 Burle Coldsaw
 8" Newton Cold Saw
 10x10" Kelley Hack Saw, new
 13x16" Peerless Hack Saw
 20" Burke Coldsaw

TURRET LATHES AND SCREW MACHINES

No. 1, 2, 8 W & S Turret, cone
 No. 1 Warner & Swasey Universal, cone
 No. 3 Foster Turret, cone
 No. 4 Bardons & Oliver, cone
 2 spindle J & L Steel Hd. Flat Turr., m.d.
 2 spindle 3x36" Jones & Lamson Turr. m.d.
 1½x18", 2x26", 3x36" P & W Turr., cone
 2½x26" Modern Turret, cone
 3x36" Jones & Lamson Geared Head, m.d.

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 21", 24" Gisholt Turret

PLANERS

24" Cincinnati Crank, m.d.
 24"x24"x6" Ohio, 1 head, belt
 30"x30"x8" Pond, 1 head, belt
 30"x30"x8" Gray, 2 heads, belt
 30"x30"x10" Cincinnati, 2 heads, belt
 30"x30"x12" Gray, m.d., 2 heads
 32"x32"x8" Gray, belt, 1 head
 34"x24"x8" Cincinnati, belt, 1 head
 42"x42"x16" Woodw. & Powell, belt, 2 hds.
 42"x42"x16" Pond, belt, 1 rl. hd., 1 sd. hd.
 54"x42"x12" Gray, rev. m.d., 2 rl. hds.,
 2 side heads

GEAR CUTTERS & HOBBERS

No. 7 Fellows H.S., m.d.
 No. 6, 61, 62, 612, 615 Fellows
 Gleason Bevel Gear Tester, belt
 6" Gleason Straight Bevel Gear Generator
 No. 1 Lees-Bradner Gear Hobber, m.d.
 No. 3, 12 Barber-Colman
 No. 5A Lees-Bradner
 No. 3 Hevy B & S Gear Cutters m.d.
 No. 3-26", and 3-36" Brown & Sharpe
 No. 3-26" Cincinnati, belt
 No. 6-60" and 6-72" Brown & Sharpe, m.d.
 No. 18H Gould & Eberhardt Gear Hobber
 16" Cincinnati Gear Hobber
 36" Gould & Eberhardt Gear Cutter, s.p.d.
 Schuchardt & Schutte Gear Tooth Rd., belt

HEAVY DUTY DRILLS

No. 217, 310, 314, 315 Baker
 No. 2, 4, 22 Colburn Mfg.
 D4 Colburn
 36" Cincinnati Bickford, m.d.
 32" Cincinnati Bickford
 24", 32" Aurora
 26", 28" Barnes
 25" Superior
 21", 24" Cincinnati Bickford
 21", 25" Weigel
 20" Barnes All Geared Self-Oiling

MULTIPLE SPINDLE DRILLS

No. 220 Baker 2 spindle
 No. 30 Natco, 16 spindles
 No. 51C Harrington, 10 spindles
 No. 26C Fox Tapper
 No. 18 Natco
 No. 15HC Fox, hydraulic feed
 No. 7D Moline 2 spindle Hole Hog
 No. 3 Baush Multiple, 30 spindles
 D2 Fox Multiple Straight Line
 No. 3 Baush Multiple, 30 spindles
 No. OSS, LSS Garvin Horizontal Duplex
 6 spindle Niles, m.d.

6 spindle National Acme Horizontal
 6 spindle 21" Hofer Gang
 4 spindle Kokomo
 4 spindle No. 2 Colburn
 4 spindle No. 2 Foote-Burt
 4 spindle No. 4 Foote-Burt
 3 spindle 20" Barnes

BALL BEARING DRILLS

2 spindle Allen
 2 spindle Edlund, m.d.
 2 spindle Henry & Wright
 2 spindle Hy Speed
 2 spindle Leland & Gifford
 3 spindle Demco
 3 spindle Edlund, m.d.
 3 spindle Leland & Gifford
 3 spindle Sipp
 4 spindle Allen
 4 spindle No. 2 Avey
 4 spindle No. 2B Edlund
 4 spindle No. 2 Fosdick
 4 spindle Henry & Wright
 4 spindle Leland & Gifford
 6 spindle No. 1/2 Avey

PUNCHES AND SHEARS

Clev. EF Double End, cap. 1 1/4" thru 1"
 Clev. EF Single End, cap. 1 1/4" thru 1"
 Clev. EF Double End, m.d., 48" throat
 No. 3 Hilles & J. m.d., cap. 1 1/4" thru 1"
 No. 6 Long & Allstaetter S.E., belt
 No. 6 Long & Allstaetter D.E., m.d.

SURFACE GRINDERS

No. 25A Head, m.d., hydr., 16" chuck
 18x48" Diamond L.D. Face, m.d.
 30x84" Diamond H.D. Face, m.d.
 54" Bridgeport Knife, belt
 60" Bridgeport Face, s.p.d.
 6' Reed-Prentice Vertical Surface, m.d.
 Springfield Planer Type Surface, m.d.

PLAIN CYLINDRICAL GRINDERS

6x18" Landis, m.d.
 6x32" Norton, m.d.
 10x18" No. 14 Brown & Sharpe
 10x36" Landis, m.d.
 10x36" Landis Integral Cam, m.d.
 10x36" Norton, m.d.
 10x50" Norton, m.d.
 10x52" Landis, m.d.
 10x72" Landis, m.d.
 12x18" Cincinnati Plunge Cut
 12x36" Cincinnati
 12x48" Modern, m.d.
 12x72" Landis, m.d.
 14x72" Norton, m.d.
 16x48" No. 3 Cincinnati
 16x52" Landis, m.d.
 16x72" Landis, m.d.
 20x144" Landis, m.d.

SEND US YOUR INQUIRIES.

MACHINERY CO.,
CINCINNATI, OHIO

SPECIALS

- (5) 14" Warner & Swasey Brass Lathes
 (10) Hand Mills.
 No. 452 New Britain Automatic Chuckers.
 2 Spindle Edlund Drill, Power and Hand Feed, Motor Drive.
 No. 1-1/2 Valley Universal Mill.
 6x6" and 9x9" Peerless Saws, Motor Drive.
 4"x60"-72"-84" Lo Swing Lathes, 2 carriages, A-1 Condition.
 8x84" Lo Swing Lathe.
 10"x10" Gauge Ohio Press Brake, M. Dr.
 No. 33 Abrasive Surface Grinder, M. D.
 48" Thompson Surface Grinder, M. D.
 8" Burr Keyseating Mill, with Vert. Spindle.
 No. 308 Espen-Lucas Cold Saw, M. Dr.
- (6) 18" Cincinnati Automatic Mills.
 (2) No. 4 Cincinnati Plain Mills.
 (5) Practically New Landmatic Heads, Capacity 2" to 4".
 30" Rotary Table, Power and Hand Feed.
 60 KVA Fassler Seam Welder, M. Dr.
 900 Ton Zeh & Hahnemann Percussion Press, M. Dr., Like New.
 18"x12' L. & S. Q. C. G. Lathe and Equip.
 28" G. & E. Shaper.
 24"x12' Porter Q. C. G. Lathe, Chucks, and Equipment, 5 HP M. D. and Motor.
 (3) Baush Mult. Spdle. Drills, 40 Spdle, Very Low Price, Will sell for parts.
 93"x10" dia. Pyramid Type Plate Rolls.
 2" Buffalo Armor Plate Bar Shear.

R. A. VINE'S MACHINERY WAREHOUSE

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22

DETROIT, MICHIGAN

NEED GOOD TOOLS? — SEE US FIRST

D-31 FOX MULTIPLE DRILL, RECT. HEAD, 18"x31 1/2" spindle centers. Bored for 36 spindles. Has ten 1 1/4 No. 2 Taper spindles. Power feed to head.

AUTOMATICS. Several Model A Clevelands, from 5" to 3 3/4" bar capacity.

BOLT CUTTER. 1 1/4" Acme single, class A; 2" Landis.

DIES AND EQUIPMENT to make square cans, including Max Ams double seamer and squeezer and Adriance double seamer.

DRILLS, 36" Cincinnati back geared, sliding head, tapping attachment; No. 2 Colburn Manufacturing; 36" Snyder, back geared; 24" Barnes All Geared Self Oiling B.D.

HAND SCREW MACHINE, Wells 7 1/2" capacity.

LATHES, Two 20"x10' Davis dbe., back gear quick change. 20"x8' Hamilton dble. back gear semi-quick change. 36"x14' Fifield.

Many other tools—exceptional "buys"—write for full details.

LATHES, 38"x14' Fifield — Cheap; 16"x8' Sidney, double back geared, quick change; 14x6 Carroll Jamison.

MILLERS, No. 6 Becker vertical. No. 3 1/2 Pratt & Whitney duplex 60" table feed 27" between spindles. No. 1 Newton slab, 65" table feed.

MONITOR LATHE, 16' Dreses, universal, with chasing bar.

PLANERS, 36"x15' Betts, 2 heads; on rail.

PRESSES, No. 1 Bliss Cam Drawing Press,

SHAPER, 14" P. & Whitney.

TURRET LATHES. Two 21" Gisholt turret lathes, two 3"x36" Jones & Lamson and one 2"x24" Jones & Lamson.

A. D. White Mchy. Co., 108 N. Jefferson St., Chicago, Ill.
 Established 1894

BORING MILLS, Horizontal

4- $\frac{1}{2}$ " bar Niles Knee Type.
 6" bar Barrett Cyl. Borer
 6 $\frac{1}{2}$ " bar D. & H. Floor Type,
 8 $\frac{1}{2}$ " x 18" Floor plate and outboard, weight 100,000 lbs.
 4- $\frac{1}{2}$ " bar N.B.P. Knee Type, M.D.
 4" bar D. & H. Floor Type with reversing and tilting table, floor plate & outboard

BORING MILLS, Vertical

6" Cinci. Bickford Extra Hwy., 17" cl.
 6" Cinci. Bickford Standard
 6" Amer. Univ. S. P. D.
 12" spindle Bausch No. 4 M.T.
 10-16" Niles Ext. Type M.D.
 60" Betts, M.D.
 48" Gisholt, P.R.T., M.D.
 44" Putnam, P.R.T., M.D.
 42" Bullard, P.R.T., M.D.
 36" Bullard Rapid Pro.
 30" Colburn, 1" Turret Head.
 24" Bullard Rapid Pro.

DRILLS, Radial

6" Mueller, Gear box, M.D.
 3" American, Sensitive.
 5" - 6" Amer. Tri. Grd.
 2" spindle Allen, M.D.
 4" Spindle No. 2B Edlund.
 4" Spindle Kokomo, No. 3 M.T.
 24" spindle Bausch No. 2 M.T.
 26" Barnes Camel Back (5).

GRINDERS

8" x 54" Fitchburg Pl., m.d.
 10" x 18" Norton Hyd. Feed.
 10" x 52" Landis Plain.
 16" x 50" Norton Self Cont.
 No. 6 Bryant Chucking.
 16" x 80" Cinci. Cyl. M.D.
 No. 3 Landis Universal.
 18" Bealy No. 26 Disc.
 18" Badger No. 220 Disc.
 20" x 96" Landis.
 No. 11 Landis Tool & Cutter.
 No. 55, 60 and 65 Heald Cyl.
 11" New Yankee Twist Drill
 Heim, Centerless.

LATHES

16" x 10' Monah L.C.G. Cone.
 18" x 8" Amer. Grd. Hd. (2)
 18" x 8" Barnes L.C.G. Cone.
 18" x 8" Lodge & S. Cone.
 19" x 8" LeBlond, Cone.
 20" x 12" New Haven, T.A.
 24" x 19" American L. C. G.

LATHES (Continued)

24" x 14" L. & S. T.A., Cone
 26" x 10' Pond, Q.C.G., Cone.
 28" / 30" x 10' Ran-Larson Gap
 30" x 16' N.B.P. Axel & Journal, Center Drive, M.D.
 30" x 25' Pond L.C.G. Cone.
 32" x 17' Fifield, triple grd.
 36" x 14" Pond, Grd. Hd. M.D.
 36" x 15" Putnam Grd. Hd. M.D.
 36" x 22" Bridgeford, M.D.
 36" x 24" Bridgeford, M.D.
 42" x 20" L. & S. Cone, Q.C.G.
 42" x 34" S. & B. Grd. Hd., M.D.
 42" x 30" Johnson Grd. Hd. M.D.
 42" x 40" N.B.P. Grd. Hd.
 48" x 36" Fifield, m.d.
 60" x 34" Putnam, raised to
 72" 90" N.B.P. Heavy, Wheel

MILLERS

Model A B Becker Vertical, S.P.D.
 No. 6 Becker Vertical.
 Model C8 Becker Continuous.
 No. 26 Becker Pl. Cone
 No. 6 Jackson Die Sinkers (3)
 No. 6 Whitney Pl. Cone
 No. 4 Cinci. Univ. Cone
 No. 4 LeBlond Pl. Cone M.D.
 No. 3 Kempamith Pl. Cone
 No. 3B B & S Pl. S.P.D.
 No. 2 Cinci. Cone, Univ.
 No. 2 Cinci. Pl. Cone M.D.
 No. 1 Standard Hand, M.D.
 No. 1 Garvin, Hand
 18" Cinci. Duplex 24" & 36"
 24" x 24" x 12" Ingersoll Adj.
 Rail Planer Type M.D.
 24" Cinci. Semi. Auto.

PLANERS

48" x 48" x 12" D&H Openside.
 48" x 48" x 10" Gray, 2 Hd.s.
 36" Newton Rotary, M.D.
 36" x 36" x 12" Chandler, 3 bds.
 30" x 30" x 10" D. & H. Openside.
 30" x 30" x 8" Powell 2 bds.
 27" x 27" x 6" W. & P., 1 Hd.
 24" x 8" Gray: 24" x 7" Niles.

TURRET LATHES

11x18" P. & W., bar
 1x15" P. & W., bar
 No. 2 W. & S., bar
 No. 6 Foster, 2-L.H. bar.
 Nos. 9 & 2 Bardons & Oliver
 24" Gish. 61 H.S., 2 Cone
 28" Gisholt M.D.
 24" x 24" & 3" x 36" J. & L.

MISCELLANEOUS

Automatic, 24" Gridley, 1 Sp. Billet Breaking Mach., Ajax. Bolt Threader, 1 $\frac{1}{2}$ " Landis. Bolt Threader, 2" Landis. Brake, Box and Pan, 6" x 10 ga. 8" fingers, M.D. Broach, No. 2 Lapointe Belt. Chucking, Nos. 34 & 23 N. B. Die Sinkers, No. 6 Jackson (3). Flanger, 1" McCabe Pneu. Gear Cutter, 110" Newton Spun Gear Cutter, No. 13 B. & S. Gear Generator, No. 1 Lees-Bradner. Gear Gen. 11" Gleason Bevel Gear Hobber, No. 12 Barber Coleman No. 3 Farwell Gear Hobber, 6" Pfauter. Gear Planer, 24" Gleason. Hammer, No. 2B Nazel, M.D. Header, 1 $\frac{1}{2}$ " Acme Rivet. Header, 2" Acme, Steel. Keystrs, No. 1 Bak., No. 1 Dav. Keyseat, Nos. 2, 3 & 4 M&M Nibbler, 36" Gray, 1", No. 3. Pipe Bender, 6" Federal, Type E. Pipe Mach. 4" Landis, M.D. Pipe Mach., 8" x 12" Williams Pipe Machine, 12" Saunders. Pipe Mach., 12" Curtis & C. Pipe Mach., 2" Bignal Keeler. Press, No. 8 $\frac{1}{2}$ Z & H Percussion Press, Forcing 50 ton Lucas Press, No. 61 Spec. V & O. Presses, No. 18 Bliss B. & FI Punch & Shear No. 47 PBC B. Punch 54" H & J No. 2 D.E. Punch, 36" Whit. 3 $\frac{1}{2}$ " x 1". Rolls, 6x1" H & J. No. 2 Angle 3x3" x 3".

Rolls, 8x1" H & J No. 2. Saw, No. 3 Ryerson Frict. D.C. Saw, 9x9" Peerless Hack. Hack, M/D. Saw, 6" Avey Milband. Saw, 6" Peerless, Hack M.D. Saw, 6" Gorton No. 2B Inter. Saw, 6" Peerless Univ. M.D. Saw, 10" Napier Band Shaper, 24" Gould & Eberhardt Shaper, 24" & 20" Queen City M.D. Shaving Mach. P. & W. Vert. Alligator Shear, Carlin 1-3/8" Sq. Shears, 10x1" L. & N. M.D. Shear, 8x4" H.J. No. 2 12" Gap. Shear, 30" Cleveland, No. X. Shear, 156" x 4" United, 36" g. 126" x 1" Amer. 22" Gap. Slotter, 18" Niles Slotter, 24" Dill A.C., M.D.

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HIGH GRADE MACHINE TOOLS FOR IMMEDIATE DELIVERY

MILLING MACHINES

- No. 1B double overarm Milwaukee m.d.
- No. 1B Brown & Sharpe.
- No. 2A Brown & Sharpe m.d.
- No. 2 Cincinnati Plain Miller.
- No. 1 Dow, b.g.
- No. 0 Brown & Sharpe, hand.
- No. 10 Pratt & Whitney.
- No. 1 Hendey b.g. Universal with dividing head complete.

RADIAL DRILLS

- 3-2 spindle Allen High Speed Drills.
- 1-5' Mueller Radial

SCREW MACHINES

- 1—No. 3A Warner & Swasey, universal.
- 1—1" Acme Screw Machine.
- 1—24" H.D. LeBlond univ. Tur. Lathe.
- 1—No. 4 Millhol. tric. head, pwr. feed.
- 6—No. 1, No. 2, No. 3 Warner & Swasey.
- 1—1" P. & W. power feed to turret.
- 1—No. 2 Brown & Sharpe Semi-Auto.
- 1—1" Millholland, hand.
- 1— $\frac{5}{8}$ " capacity Pratt & Whitney.
- 2—No. 2 Bordens & Oliver.

BORING MILLS

- 60" Rogers, m.d., push bar, control.

36" Bridgeport.

LATHES

- 14x6 Hendey, Pan bed.
- 16x8' LeBlond q.c., taper att.
- Sidney 18x8', d.b.g., q.c.g.
- 18x8' South Bend, m.d., q. c.
- 18x8' Monarch quick change, d.b.g.
- 16x6 L. & S., d.b.g., pan bed g.c.g.
- 14x28x6' Fay & Scott Gap Lathe, m.d., geared face plate drive.

SHEPERS:

- 14" Steptoe.
- 16" Hendey.
- 16-20-24" G. & E.
- 24" G. & E. power fed. to head.
- 24" Heavy Duty Wolcott.
- 24" Barker Shaper.

GRINDERS:

- No. 2 Brown & Sharpe.
- No. 1 LeBlond univ. cutter, ream. qdr.
- 18" Bealy disc Grinder.

SHEARS:

- 10' 16 ga. Geo. A. Ohl M.D. Shear.

HACKSAWS:

- 10x10 Napier Band type M.D. Saw.

This is a partial list. Write or wire us your requirements.

We will pay cash for surplus Equipment. Let us know what you have.

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- 146x6 Mulliner-Edlund Tool Lathe
- 14x6 Hendey Lathe, cone hd., taper
- 14x10 Am. q.c. Lathe with taper
- 16x8 Am. q.c. Lathe with taper
- 16x8 Lodge & Shipley cone dr.
- 17x8 Sidney q.c. Gear Lathe
- 18x6 L&S. 12-sp. Gr. H. Lathe
- 18x8 Boye&Emmes cone dr., tap. at.
- 19x8 LeBlond Cone Hd. Lathe, tap.
- 20x8' Hamilton Grd. Mfg. Lathe
- 24x10 S&B cone hd. with taper
- 24x12 Am. 12-speed Gr. Hd. Lathe
- 24x14 S&B cone hd. with chuck
- 32x14 L&S Cone Drive
- 32x28 Bullard Triple Grd.
- No. 3 Oilgear Hydraul. Broach. Mch.
- Twin Ten Oilgear Hyd. Broach. Mch.
- Rockford Dbl. End Hydraulic, m.d.

- 3A W&S High Hd. Univ. Tur. Lathe
- 1½" Landis Dbl. Bolt Cutter, b.d.
- 2" Landis Dbl. Bolt Cutter, b.d.
- 3" Landis Sgle. Bolt Cut, leadscrew
- C-12 Natco 12x18 Hd. Mult. Drill
- C-13H Natco Hydraulic Mult. Drill
- No. 14 Natco 16x24 Multiple Drill
- No. 30 NATCO 24x40 Multiple Drill
- No. 40 Natco Straight Line Mult. Drill
- 3½" Western Radial Drill
- 3' Carlton Sensitive Radial Drill
- 6' Cincinnati Plain Radial Drill
- Avey No. 3 Dbl. Spdle. Horiz. Drill
- No. 6 Jackson Die Sink. Machine
- 48" Newton Dbl. Spd. Cont. Miller
- 12x18 Cinc. Plunge Cut Grinder
- 16" Heald Surface Grinder
- No. 3 W. & M. Surf. Grinder

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**NORTON MOTOR DRIVEN
GRINDERS**

6"x16"	10"x50"	16"x50"
6"x32"	10"x72"	16"x72"
10"x18"	10"-15"	18"x96"
10"x24"	gapx72"	18"-24"
10"-15"	14"x36"	21"x96"
gapx24"	14"x50"	21"x144"
10"x36"	14"x72"	23"x120"

BORING MACHINES

No. 3-A Universal, 3" Bar.
No. 2 Barrett, 5" bar, extension bed.

BORING MILLS

36" King
42" Gisholt
48" Gisholt.
52" Gisholt.
54" Colburn.
60" Colburn.
60" Gisholt, M.D.
72" Bickford.
72" King, motor drive.
72" Niles, Bement, Pond, M.D.
10' Niles.

DRILLS

1, 2, 4, 6 Spdl. Leland-Gifford.
1, 2, 4 Spdl. Henry & Wright.
No. 25-24" Foote-Burt.
No. 2 Colburn, 3 & 4 Spindle.
No. 4-5 spdl. Foote-Burt.
No. 1, No. 3, No. 4 Baush Multiple.
3' Western Plain Radical.
4' Western, motor on column.
6' American Plain
6' Western Plain Radical.
7' American Full Universal.
7' & 8' Western heavy Radial.

GEAR CUTTERS

No. 2, 3, 12 Barber-Colman.
No. 1/2, No. 1 Pfauter Hobber.
No. 2 Pfauter Hobber.
No. 3, 4, 5, 6 Brown & Sharpe.
Nos. 6, 61 & 624 Fellows.
No. 6-A-72" Cincinnati.
18" Gleason Bevel Generator, m.d.

GRINDERS

No. 2 Thompson Univ.
No. 2 1/2 Universal (Bath type).
No. 4 Landis Universal.
No. 70 Heald Internal.
No. 16-26" Blanchard Vert. Surface, M.D.
No. 22-12" Heald Rotary Surface.
No. 3 Barber-Colman Hob Sharpener.
16"x32" Landis Crankshaft.
14"x96" Norton Face.

LATHES

16"x8" Flather.
18"x8" Lodge & Shipley.
18"x12" American.
20"x10" Lodge & Shipley.
20"x12" Lodge & Shipley.
20"x12" Mueller.

LATHES—Continued

24"x12" American.
24"x13" Chard.
24"x16" Lodge & Shipley.
24"x18" American.
24"x20" Lodge & Shipley, Taper.
24"x22" Lodge & Shipley, Taper.
27"x18" Sidney, Taper.
30"x12" Whitcomb-Blaisdell.
30"x12" Lodge & Shipley, taper att.
36"x16" American, taper.
36"x24" Bradford, taper att.
40"x12" Fifield.
46"x30" Houston, Stanwood & Gamble, m.d.
60" New Haven turning & boring.
20"-40"x10" Rahn - Larmon Geared Head Sliding Bed Gap.

MILLERS

No. 5-B Becker Vertical.
No. 6 Becker Vertical.
No. C-2 Becker Vertical.
ACS Becker Continuous Vert.
No. 4 Hendey Lincoln.
Type "B" Briggs Lincoln.
No. 7-H Becker Lincoln.
No. 8 Hendey Lincoln.
No. 12 P. & W. Lincoln.
No. 3 Garvin Duplex.
24" Cincinnati Duplex.
No. 33 Becker Brainard.
24"x24"x12" Ingersoll Adj. Rail.
36"x36"x12" Newton Duplex.
38"x44"x20" Ingersoll Slab.
72"x16"x14" Ingersoll Slab.
No. 1 Smalley-General Thread Miller.

PLANERS

24"x24"x6" Rockford.
24"x24"x12" Gray.
30"x30"x8" American.
30"x30"x18" Cincinnati.
36"x36"x8" 18" Cincinnati.
42"x42"x14" Gray.
48"x48"x10" N-B-P.
60"x48"x20" Hamilton.
72"x60"x16" American.

PRESSES

No. 01 & No. 1 V.G.O., M.D.
No. 1 1/2 V.G.O., M.D.
No. 20 Bliss, M.D.
No. 21 Bliss.
No. CG-24 Ferracute, Geared, M.D.
No. 3 & No. 5 V.G.O., grd., M.D.
No. 58 Toledo Nosing presses.

TURRET LATHES

No. 6-2" Wood A.C. & B.F.
No. 4-18" Millholland Grd. Hd.
No. 6-21/4" Warner & Swasey.
18" Libby-International, 5" H.S., M.D.
No. 3-A Warner & Swasey, A.C. & B.F.
24" Warner & Swasey.
24" Steinle.
24" Gisholt, 6 1/4" H.S.
34" Gisholt, motor drive.

HILL-CLARKE MACHINERY CO.
645 W. WASHINGTON BOULEVARD, CHICAGO

TURRET LATHES

No. 9 Bardon & Oliver, 2½" Capacity
 No. 9 Foster, 2 13/16" Capacity
 No. 6 Warner & Swasey
 " x 6" Acme, Plain Head
 No. 1 Brown & Sharpe, Motor Driven

MILLERS

No. 4A Brown & Sharpe (Heavy) Universal Miller, Vertical Attachment
 No. 20 Van Norman, Motor Driven
 No. 1 Kearney & Trecker Plain, Motor Drive in Base—Power Rapid Traverse
 No. 6 Whitney Hand Millers (10)

GRINDERS

No. 72 Heald "Sizematic" Hydraul. Fds.
 No. 2 Brown & Sharpe Universal
 No. 33 Abrasive Vertical Spindle

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Exceptional Machines
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NEW

Kempsmith No. 2L Millers
 American 24" Shapers
 Gleasor 12" S. T. Gear Gen.
 Cincinnati Millers, Plain, Vertical and Universal
 Many Other Items

SPECIAL

Cincin. 8x18 & 8x36 Mtr. Drive
 GRINDERS

USED

B. & S. OG Auto. with new Spindle Assembly—\$1750
 Cincinn. No. 2 Plain Millers
 B. & S. No. 2 Univ. Miller—\$1300
 Bullard 76" Vert. Bor. Mill—\$2250
 25 lathes
 12" to 36" Swing up to 20' bed
 Hendey, L & S. etc., some Geared Head
 G. & E. 16" & 24" Shapers
 Natl. Acme 3" 4 Sp. Automatic—\$875



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Victor's Bargains

IN NEW HIGH SPEED STRAIGHT SHANK TWIST DRILLS JOBBERS OR SHORT LENGTH



Size Inches	Our Price Net Per Dozen High Speed	Length Overall Inches
1-16	\$ 1.46	2½
5-64	1.52	2¾
3-32	1.56	2¾
7-64	1.66	2¾
1-8	1.76	3
9-64	1.90	3⅛
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1-4	3.29	4
17-64	3.65	4⅓
9-32	4.01	4⅔
19-64	4.38	4⅔
5-16	4.75	4½
21-64	5.23	4¾
11-32	5.72	4¾
23-64	6.21	4¾
3-8	6.70	5
25-64	7.29	5⅓
13-32	7.91	5¼
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- PRATT & WHITNEY No. 13 Multiple Spindle Drill Press, rectangular head.
- ALLEN High Speed Sensitive Drills 2, 3, and 4 Spindle.
- NATCO No. 14 Multiple Spindle Drill, 22 spds., R.A. Head, 18" x 26". Table 22" x 30", S.P. Drive. Serial 14,222.
- BROWN & SHARPE No. 2 Surface Grinders.
- BETTS 18" Crank Slotter, countershaft drive. Will slot center of 85" diameter.
- GOULD & EBERHARDT Crank Shapers, Cone Drive 24"—16".
- CLEVELAND 23½" Auto. Model A.
- GRIDLEY 1¾" 4 Spindle Automatic Model F., countershaft drive.
- LOY & NOWRATH 10 ft. Power Squaring Shear, 3/16 capacity, M.D.
- DREIS & KRUMP 6' Box & Pan Brake, Motor Drive, 10 gauge.
- NIAGARA 7-B Geared Inclinable Power Press, 5" stroke.
- BLISS No. 7½ geared S.S. Press, Tie Bar.
- BLISS No. 1½ Geared D.A. Press.

Other just as desirable tools in our large stock. Send for catalog.

MORRIS MACHINERY COMPANY

97 Chestnut Street

Newark, N.J.

HIGH GRADE MACHINE TOOLS

AUTOMATICS

1" & 1½" New Brit. 6 spindle
1" Cleveland Mod. J, dbl. end
1½", 1¾" & 2½" Gridley
1½" Cone, 4 spindle
1½" Cleveland "M," 4 spdl.
1½", 2", 2½" Nat. Acme, 4 spdl.

3½" National Acme Gridley
Nos. 24 & 33 New Britain
18" Gisholt Simplimatics

COMPRESSORS

67", 6"x6" Chi. Pneu. NSB
136", 8"x8" Chi. Pneu. NSB
136", 8"x8" I. R. type ER
166", 8"x9" I. R. type ES
218", 10"x10" Chi. Pneu.
265", 9½"x10" Worthington
355", 12"x10" I. R. type ERI
357", 12"x10" Bury
369", 12"x10" Chi. Pneu. NSB
550", 3 cyl. National
620", 14"x8½"x10" Sullivan
676", 15"x9½"x12" I.R. type XRE
706", 17"x9½"x12" Sullivan
868", 17"x10"x12" Chi. Pneu.

OCB

DRILLS

21", 24", 28" Cincinnati
21", 25", 28" Superior
30" Snyder
20" & 24" Barnes all geared
Nos. 121, 217, 314, 315, 321
Baker
No. 2 Colburn, 1, 2, 3, 4, spdl.
24", No. 4 Colburn
15", No. 2 Avey, 1, 2, 3 spdl.
24", No. 3 Avey, 1 & 2 spdl.
16" Fosdick, 1, 2, 4 & 6 spdl.
Nos. 11, 12, 13, 14 & 30 Natico
mult. 8 to 60 spds.

3" Cincinnati Bickford radial
3" Dresen radial
3½" Morris radial
3½", 4", 5" & 6" Western radial
6" N.B.P. univ. radial
No. 15½" Foote Burt Mfg.

FORGING MACHINERY

1½", 2", 2½" & 4" Ajax
upsetters
1½" Acme upsetter
No. 1A Ajax forging rolls
No. 3B Nazel hammers
400 & 600 lb. Chambersburg
board drop hammers
3/8" No. 3 Manville header
Nos. 25 & 9 W.E.W. bulldozers.

GRINDERS

6"x18", 10"x52", 12"x36", 12" x72" Landis
6"x32", 10"x36", 10"x50", 14" x50" & 14"x72" Norton
12"x24" Modern
12"x40" No. 3 B. & S. univ.
12"x36" No. 2½ Bath univ.
No. 2 Ohio tool & cutter
No. 2 Norton tool & cutter

No. 184 Greenfield tool & cut.
No. 1 Bath tool & cutter

No. 6 Bryant internal
No. 70 Heald internal
18", 24", 30" & 53" Gard. disc
18" Gardner semi-automatic
No. 96 Gardner hydraulic fd.
No. 84 Gardner, 24" opp. disc
No. 221 Badger, 24" opp. disc
2½" Wilmarth & Morman drill
1½" & 3" Oliver drill
26"x36" Blanch. rotary surf.
12"x36" Diamond surface
16"x50" Safety Emery surface
12", No. 22 Heald rotary
8" & 12" Arter rotary
8" Arter auto. Id. piston ring
Pratt & Whitney worm grind.
National Tool Co. worm grd.
24" Ingersoll milling cutter
No. 524 Mumford Dixon rad.
Osterholm resurfacing grds
10"x50" Norton cam
10"x27" Bath spline
Gisholt tool
84" Diamond face & edge

ENGINE LATHES

10"x5" Pratt & Whitney
12"x6" Monarch
13"x6" Willard
14"x6" Monarch
14"x6" Walcott
16"x6" Monarch
16"x6" Hendey
16"x6" Cincinnati
16"x9" Lehmann
16"x10" Leblond
17"x8" Leblond
18"x8" L. & S. geared head
18"x9" Chard
21"x18" Leblond
22"x10" Davis
22"x12" Morris geared head
23"x10" Rahn Larmon
24"x10" LeBlond
24"x10" Boye & Emmes
24"x10" L. & S. geared head
24"x12" Lodge & Shipley
24"x16" Boye & Emmes
26"x10" Wickes
26"x12" Wickes
26"x15" American geared hd.
30"x12" Lodge & Shipley

TURRET LATHES

Nos. 2 & 4 Warner & Swasey
No. 4 Cincinnati Acme
Nos. 3 & 4 Foster
21" Gisholt
24" Steinle
3"x36" Jones & Larmon
Jones & Larmon 2 spindle
No. 4 Bardons & Oliver
2½"x26" Greenlee
2½"x26" Pratt & Whitney

MILLS, BORING

40" Bullard
42" Bullard, MD, PRT
42" Detrick & Harv. MD, PRT

3" Binsee horizontal
5" Barrett cylinder boring
MILLERS

No. 4 Cincinnati vertical
Nos. 5C & 6 Becker vertical
No. 2 Cincinnati
Nos. 2B & 2BS Milwaukee
No. 2 Rockford
Nos. 2 & 3 Kempsmith
No. 4 Kempsmith Maximill
No. 4 LeBlond
No. 6 National Transit
No. 3H LeBlond universal
6"x14" Pratt & Whitney thrd.
24" Cincinnati duplex auto.
48" Cincinnati automatic
No. 3 Rockford Rigidmil
No. 31 DeVlieg Supermill
No. 21 Brown & Sharpe auto.
36", 42" & 72" Inger. cont. rot.
Model C Becker rotary
48" Ohio tilted offset
28", 37" & 42" Briggs
Nos. 1 & 1A Davis & Thomp.
Type 45 Bilton Productomatic
No. 33 Kempsmith production

PRESSES

750 ton Baldwin Southwark
triple act. hyd. toggle draw.
142½" bet. uprs., 84" shut
height, 550,000 lbs.
600 ton No. 664B Toledo coing.
40" between uprights
150 ton No. 661 Tol. coin. 3" str.
100 ton French Oil Mchly. Co.,
hyd. press for strting. casts.
108" No. 7961/4D Toledo Double
Crank Toggle Drawing
95" No. 7961/4C Toledo Double
Crank Toggle Drawing
No. 1½" Bliss Toggle Drawing
No. 164 (173) Tol. Tog. Draw.
No. DDG54 Ferr. cam draw.
48" No. 6A Bliss double crk.
Tie rod frame, roll feed
45" No. 151 Ferr. Dble. Crank
28" No. 71 Swaine dble. crk.
gap frame
No. 21½" Bliss Consd. OBI
No. 5-I Cleveland O.B.I.
Waterb. F. O.B., non-incl.
Frem. O.B., non-incl., 2½" str.
No. P2 Ferracute
No. EG35 Erie punching
No. 94 Bliss Consd. Punch.
Nos. 55, 55½, and 56 Tol. str.
No. 55½ Toledo straight side
with side shear
No. 65 Consd. straight side
No. 7 Rockford, straight side
No. 8-7 ZEH & Hn., str. side
No. 74½ Bliss, straight side
No. 4 Massillon, str. side, grd.

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MILES MACHINERY CO.,

SAGINAW, MICH.

GOOD MACHINES

Bliss No. 3½ S.S. D.C. Press 3" stroke, M.D. with A.C. Motor

Boring Mills: Bullard Rapid Production, 36" cap. Turret and side head.

Milling Machines: Brown & Sharpe No. 3 Pl. Cin. No. 2 Univ., Kemps. No. 1 Univ., Rockf. No. 1½ Univ.

Lathes: Hendey q.c.g. 16"x10' Tap Att., Sidney 18"x8' q. c. g. M. D. American 18"x10' q.c.g. taper att.

Brakes: Chgo. Steel Power Apron 8' ½ cap. M.D. Press Brake 5' 14 ga. M.D.

Roll: 6"x1¼" cap. power forming, drop end M.D. with motor.

Shears: No. 208A Nia. Shear & Flanger 8 ga. cap. M.D. with motor

Automatics, No. 2 Brown & Sharpe, High Speed, (6).

Band Saw, No. 8 Marvel, motor drive.

Brakes, hand, 8' 18 ga., 8' 14 ga., (2).

Drill Presses, 4 sp. Leland-Gifford & Aveymatic, H. S.

Grinders, surface, No. 2 LaSalle; No. 2 Wilmarth & Morman.

Hobbers, No. 3 & No. 12 Barber-Col.

Lathes, 18"x8' Boye & Emmes, 17"x8' Sidney, 24"x12' Advance, 20"x8' American.

Millers, Nos. 2A & 4B Becker verticals.

Punch Presses, Nos. 1 to 5 O. B. I.; several straight sided.

Radial, 3½ Cincinnati Bickford, M. D.

Shaper, 24" Stockbridge, M. D.

Slitter, No. 235A Bliss, 36", S. P. D.

Slotter, 3½ Rhodes.

Turret Lathes, No. 2A Warner & Swasey, complete with bar equipment.

300 High Grade Tools In Stock.

VICTOR Machinery Co.

130-132 South Clinton St., Chicago, Ill.

ACME EQUIPMENT CO.

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No. 3B Brown & Sharpe plain milling machine, single pulley drive.

No. 1½ Rockford plain milling machine, cone drive.

No. 2 Cincinnati univ. knuckle joint, cone drive.

24" Cincinnati and 25" Smith & Mills Shapers.

5' N. B. P. full universal radial drill, a.c., motor drive.

4' Bickford plain radial drill, gear box drive.

8' x 10 ga. D.&K. steel apron brake, 8" fingers.

50" x 10 ga. Stamco square shear, gauges complete.

150 and 400 ton hydraulic 48" wheel presses.

20—24" Upright drills, and 20" and 24" 4-spindle drills.

25 stamping presses—1000 lb. to 18000".

LARGE STOCK OF GOOD MACHINE TOOLS

THE NORTON-BROADWAY MACHINERY CO.

6th & Baymiller Streets,

CINCINNATI, OHIO

Good Used Machinery

ARC WELDER—G. E. 200 amp., m.d.

BORING MILLS—Niles 36" c. d. Baush 44" m.d. Bullard 51" Vert., 2 hds., Bullard 42" Mill, vert.; Rockf. No. 2 horiz., 3½" Bar; Colburn 42" Vert. 2 Hds.

BRAKES—D. & K., 5' Box & Pan, 14 ga. Keene 10' 16 ga. Toggle Press.

DRILLS (RADIAL)—Mueller 2½", Fosdick 2½", Fosdick 4", Carlton 4" all gear box dr.; Hammond 4" sensitive; Mueller 4½" g. box; Bickford 4" Gr. Box.

DRILLS (H. S. B. B.)—H & W 2, 4, Sap.; Allen 2 & 6-sp.; Avey, Demco, Lel-Giff. 1-sp.; Sipp 2 & 3-S.P.; Avey 2-sp.; Avey-matic 2-sp., m.d.

DRILLS (MISC.)—Baker No. 217 (2) & No. 314 Hvy. Duty; Hamilton 42" S.H.; Barnes 20" & 24" 1-sp. & 20" 4-sp. & 24" 3-sp. all grd. camel back; P & W No. 12 Multi-Sp.; Natco 20-sp. Rect. head.

GEAR CUTTERS—G & E 60" & B & S 26" s. p. d. automatic spur; Fellows 24" gear shaper. Cincinnati 36" gear cutter. G. & E. 48" gear Cutter.

GRINDERS—P & W 12" vert. surf.; Cin. No. 1½ & B & S No. 12 univ. tool; B & S Nos. 11&16 pl. Head No. 60685 Int.; Landis 10x30" Plain; B & S 10x48"; Norton 6x32" plain, Head No. 20 Rotary Surface (3); Badger No. 220, auto. d. e., opposed disc (4); Norton 10" x 36"; Diamond No. 2 Auto. Surf. Ott 5x18" Pl.

KEYSEATERS—Mits & Merrill No. 5 vert. Davis No. 1; M&M. No. 0; Catlin No. 2. Catlin No. 4.

LATHES—Monarch 16"x10" M.D.; LeBlond 18x8"; Lehmann 18"x9"; Amer. 22x8"; Davis 22"x10"; L & S 20"x10"; S-B & E 20"x10" q. c. q; Flather 22"x10"; LeBlond 16"x8"; Gleason 45"x12"; Monarch 16" x 8" (2); Ryerson 20x10", m.d.; Mueller 22"x12", S.B.E. 30"x12" Q.C.G. Reed 26" x 18" Bed

MILLING MACHINES—B & S No. 1, Cin. No. 1½, Ohio No. 29, Kemp. No. 3 & Brown & Sharpe No. 3 Universal; Dow No. 1, Ohio No. 20, American No. 1½, Cin. No. 3, Hendey No. 3, B & S No. 3, LeBlond No. 3H, LeBlond No. 4 M.D. C.D. & Cleveland No. 2 S.P.D. Plain, Cin. 24" Auto. Plain; Kemp. No. 33 S.P.D. Prod.; Becker No. 6 and Model "B" Vertical; Owen Duplex; Ingersoll M.D. Slab Miller 4 hds.; Becker No. 5-B Vertical.

PLANERS—Gray 30"x30"x10' 2 heads; Gray 48"x48"x10'; Gray 28"x28"x6' 1-hd.; Pond 32"x34"x10'; Sellers 36x36x 12'

PUNCH PRESSES—Federal Nos. 1, 2, 3 o.b.i.; Bliss No. 18 & 19; Ferracute No. P-4; Fer. No. EGF 52 Coining; Willard No. 4A o.b.i.; Swaine No. 38 arch, Swaine No. 37 O.B.I.; Rockford Nos. 2 & 3; and Verson No. 4 O.B.I.; Bliss No. 19½; Michigan No. 4 O.B.I.; Niag. No. 4, Niag. No. 5, L & J No. 3, Walsh No. 1, O.B.I. Bliss No. 68-N.

SAWS (HACK)—Rac. 6x6" h.s.; Rac. 8x8; Peerless 6x6" H.S. (4); Atkins 8x8" Universal Shaping (2).

SHAPERS—S & M, G & E, Ohio, Mi., Q. City, Davis, Cin. 16"; Ohio & G & E 20"; S & M, Q. City, Rock, Cin. 24"; Ohio 26"; Cin. 24" s. p. gr. box; American 24" heavy, b.g. Amer. 15"; Springi. 15"; S.M. 26", b.g. G. & E. 24", s.p. gearbox; Amer. 20"; Rhodes 7"

SCREW MACHINES—W.S. Nos. 4, 6, & 8 Hand; Nat. Acme. Nos. 515, 4-sp.; Gridley 4-sp. 7½"; Automatic, Gridley 4 spindle, 2½"; B.S. No. 4 Hand.

SLOTTER—Bement-Miles 10" vert.; Barr 12".

SQUARE SHEARS—Ohl 10" 10 ga.

TAPPING MACHINES—(2) Garvin No. 2 & 2X Vertical Automatic & Garvin No. 1.

TURRET LATHES—Bullard 36" vertical, rapid production. Bausch 30" M.D.; Bullard 24" vert. rap. prod.; W.S. No. 8; King 32" Vert. Turret. Potter & Johnston

Above is only a small part of our large stock on hand

McDonald

MACHINERY CO.
1531-35 N. Broadway ST. LOUIS, MO.

HIGH GRADE MACHINE TOOLS

No. 2 Brown & Sharpe Universal Milling Machine, C. D., Complete.

No. 3 Cincinnati Plain Milling Machines, C. D., D. B. G., (2).

No. 3 Cincinnati Plain Milling Machine, High Power, C. D., D. B. G.

18"x8' Monarch Lathe, Q. C. G., D. B. G., Pan Bed, C. D.

21"x10' LeBlond Lathe, Heavy Duty, Q. C. G., D. B. G., C. D.

16" Gould & Eberhardt Shaper, Single Pulley Drive.

12—Precision Bench Lathes, Stark, Rivett, Hardinge, Etc.

ROYAL MACHINERY EXCHANGE
401-3 BROOME ST. NEW YORK CITY

MOSER'S HIGH GRADE TOOLS

1½" 4-Spindle Gridley Automatic.

20" 4-Sp. Barnes Drill, A. G., P. F.

14" Pratt & Whitney Ball Bearing

Vert. Surface Grinder complete.

Oliver Cutter Grinder, 24" cap. milling cutters complete with motor.

No. 1 Gardner Dbl. End Grinder, Motor Drive.

MOSER MACHINE TOOL SALES, 1008 W. CLYBOURN ST., MILWAUKEE, WISCONSIN

GUARANTEED MACHINES—

AUTOMATIC SCREW MACHINES

Clevelands	Model	Ser. No.	Drv.
16-3/4"	A	34000	Plain
1-1/4"	A	26300	Plain
4-3/4" x 1/2"	B	31000	Plain
7-1/4"	B	34000	Plain
2-2/4"	B	34000	Plain

Brown & Sharpes

No. 00G Full Auto.

No. 00 Full Auto.

Gridleys

1—7/8" 4 spdl.

1-1/4" 4 spdl.

4—3/4" 4 spdl.

1-2 1/4" 4 spdl.

G 8600

G 10000

F 4400

F 8000

		M.D.	
No. 1 & 5 Foster, plain head Auto.	Chuck		
No. 4 B. & S. Wire Feed Pwd.	Feed		
No. 2 Millholland, wire fd., collets, Arr.	M.D.		
No. 6 W. & S. F B G. Belt driven, Wire Feed			
14", 21", Gisholt Turret Lathes			

HAND SCREW MACHINES

No. 1 2, 3-4 spdl. Allen H.S. BB., B.F. 7/8" cap.

1-3 Spdl. Lel-Gif. 14" Swing, H.S. B.B., 7/8" cap.
1 Spdl. Avey No. 2 M.T. H.S., BB., 7/8" cap.

DRILLS

12, 3-4 spdl. Allen H.S. BB., B.F. 7/8" cap.

1-3 Spdl. Lel-Gif. 14" Swing, H.S. B.B., 7/8" cap.
1 Spdl. Avey No. 2 M.T. H.S., BB., 7/8" cap.

GRINDERS

No. 70 Heald Internal Ser. No. 2400, BD.

No. 103 Rivett Internal BD.

No. 2 Norton Cutter Gr. Equip. BD.

No. 1 O.S. Walker Cutter grinder BD.

No. 2 B. & S. Surface, Chuck, Generator

No. 3 Wilmarth & Marmon, wet surf. Gr.Ch.

IMMEDIATE DELIVERY

No. 3 Van Norman 4"x15" Cyl. M.D.

No. 8 Ott Plain Cyl. 6"x18" B.D.

No. 12 B.&S. Plain Cyl. 12"x36" B.D.

LATHES

So. Bend 9"x3", 2 chucks, B.D.

So. Bend 13"x5" Pl. Ch. chuck, B.D.

So. Bend 13"x6" Gap Pla. Ch. Bd.

So. Bend 15"x5" Pl. Ch. chuck B.D.

South Bend 15"x5" Q.C. chuck, belt driven

Pratt & Whitney 16"x6" semi-q.c. chuck

Schumacher & Boye 18"x10" Q.C. tap. att.B.D.

Greaves Klusman 18"x6" plain with turret

Monarch 18"x6" Geared head, tap. att. MD.

Simplex 12"x5" Geared head, single pulley dr.

MILLERS

24" Bullard vertical Boring Mill, side head

No. 2 Knight Vertical Univ. with slotter, B.D.

No. 9 Kempsmith Plain arbor B.D.

Hand Millers, Chgo. Whitney, Pratt & Wright

8" Pratt & Whitney Prod. Mill Arr. M.D.

PRESSES

25 ton Henry-Wright, dieing, with feeds, B.D.

No. 15 Robinson, horn type, table, direct M.D.

No. 3 R. & K. O.B.I. 2 1/2 str.

No. 4 Federal O.B.I. 3" stroke, 37 ton

SHAPERS

20" Smith & Mills B.G. Vise B.D.

20" Steptoe, B. G. vise, C/S

MISCELLANEOUS

36" Niagara Power Sq. Shear 14 gauge

G. & E. Rope Drop Hammer, 75 lb. cap.

Hammers, High Speed, 3A and 5A

Keyseater No. 2 Mitts & Merrill, equipment

SCOTT MACHINERY SALES, INC., 1811 CARROLL AVE., CHICAGO, ILLINOIS

AUTOMATICS

$1\frac{1}{2}$ " Mod. B. Cleveland
 $\frac{7}{8}$ " Mod. G. Gridley
 $\frac{7}{8}$ " Mod. M. 4SP. Clevelands (6).

BORING MILLS

$3\frac{1}{4}$ " Binsse Hor. Knee Type
 10 Ft. Pond, Vert.

LATHES

$36'' \times 16'$ L. & S. Q.C.G., 5 Step Cone Dr.
 $18'' \times 12'$ Am. Q.C.G., D.B.G., 3 Step Cone Dr.
 $16'' \times 8'$ Am. Q.C.G., D.B.G., Taper, 3 Step Cone Dr.
 $14'' \times 6'$ Seneca Falls, Q.C.G.

$14'' \times 6'$ Rockford, Prod., Q.C.G.

MILLERS

No. 3 Cinc. pl., Cone DR.
 No. 12 B. & S. Pl., Cone Dr.
 No. 15 Garvin Pl., Cone Dr., All Att.

SHAPERS

$15''$ P. & I. Swiv. Table, Vise, Cone Dr.
 $15''$ Simmons, Swiv. Table, Vise, Cone Dr.
 $16''$ Am., Swiv. Table, Vise, B. G., Cone Dr.
 $20''$ Stockbridge, Vise, Cone Dr.

TURRET LATHES

$2\frac{1}{4}$ " J. & L. (2) $1\frac{1}{4}$ " W. & S.
 $\frac{5}{8}$ " P. & W. 6A, P. & J. S., S. P. D. (3)

TRIPLEX MACHINE CO., 117 FOURTH STREET PITTSFIELD, MASS.

WE HAVE IT IN STOCK!

AUTOMATICS

Cleveland $1\frac{1}{4}$ " Model "A"
 Gridley $\frac{7}{8}$ " 4-spindle, Model "F"
 Brown & Sharpe No. 00

DRILLS & RADIALS

Cincinnati-Bickford $4^{\prime\prime}$
 Fossick $3^{\prime\prime}$ and $2\frac{1}{2}^{\prime\prime}$
 Niles $6^{\prime\prime}$ Universal
 Silver $3\frac{1}{2}^{\prime\prime}$ Plain
 Carlton $3^{\prime\prime}$ Sensitive
 Avery; L&G; Demco; H&W Ed-
 lund 1, 2, 3, 4 spindles

HENDEY TOOL ROOM LATHES

$12x5$; $12x6$; $14x6$, Geared 14
 $x6$ Tie Bar; $14x6$ Tie Bar
 and Taper; $14x10$ Grd.; 16
 $x6$ Tie Bar; $16x6$ Tie bar
 and Taper

LATHES

Warner & Swasey No. 2A Tur-
 ret, Bar Mach.
 Boye & Ennes $32x14$ Cone,
 Q.C.G.; T.A.
 LeBlond $14x8$; $14x6$; $19x8$
 American $20x8$ Grd. Hd.; 16
 $x8$ Cone
 Lodge & Shipley $14x6$; $16x6$;
 $24x16$
 Monarch $14x6$; $16x6$
 Rockford $14x6$

HYDRAULIC WHEEL PRESS

35-ton cap.; $54''$ between
 rods; $17''$ distance ram to
 resistance

SHEARS

No. 236 Nia. $36x14$ ga. (4)
 No. 16A Nia. Ring & Circle
 No. 136 Stoll $36x16$ ga. cap.
 No. 142 Stoll Sq. $42x16$ ga.
 No. 748 Niagara Grd. Over-
 dr.; M.D. $48'' \times 3/16''$ cap.

STEEL POWER BRAKE

D&K Apron Bending Brake;
 M.D. $6'' \times \frac{3}{8}''$ capacity

AUTOMATIC PIN GRINDER

Arter No. 132—Self contained

PRESSES

Bliss No. 18; 10; 19C; 20;
 21 ; $21\frac{1}{2}$ OBI
 V&O No. 1; $3\frac{1}{2}$; 3; $3\frac{1}{2}$ OBI
 Baxendale No. 4 OBI (15)
 Niagara No. 3; No. 4
 Toledo No. 75; No. 14
 Toledo 250-ton Coining Press
 Toledo 100-ton Coining Press
 V&O No. 12½ Dble. Acting Dial
 Feed
 Bliss No. 37½ S.S. Geared

GRINDERS

$12''$ Heald Rotary
 $14x50$ Norton Plain
 $6x20$ Landis Universal
 Nos. 2 & 2½ Bath Universal
 No. 3 Abrasive Surface
 $12x36$ P&W Vertical
 No. 3 Landis Universal $12x36''$

MILLERS

Brown & Sharpe No. 1½ Plain
 Cincinnati No. 4; $3\frac{1}{2}$; 1½
 Kempsmith No. 3; 2 and 1
 Ohio No. 3; No. 2 Universal
 Garvin No. 2A Universal
 Rockford No. 2 Universal
 Brown & Sharpe No. 13-B

GOULD & EBERHARDT SHAPER

$34''$ stroke
 Motor Driven

MISCELLANEOUS

Abrasive No. 3 Surface Grinder
 Norton $14x50$ Grinder
 Pease $36''$ Blue Printer
 Nilson 4-slide Wire Former
 Electric Lift Truck 4000 lbs.
 Farrel Rolling Mill $22x12''$
 Miner 400 lbs. Drp Hammer
 Leveller Rolls $60'' \times 10$ ga.

LODGE & SHIPLEY LATHE

$16'' \times 6'$
 Geared Head; Motor Drive;
 Complete and in Perfect Cond.

MULTIPLE PUNCH

Williams & White $10'' \times 6''$ bed;
 $7''$ shaft; $2\frac{1}{2}''$ stroke; 175
 ton. Wt. $38,000$ lbs.; M.D.

BORING MILL

$54''$ Colburn; Vertical Boring
 & turning Mill; Arranged for
 M.D.

WARNER & SWASEY NO. 4
 Universal Turret Lathe; Bar
 Feed; 6-speed Geared Hd.;
 Single Pulley Drive

FALK MILL SUPPLY CO., Inc., 18 Ward St., Rochester, N. Y.

NEW 3 Phase B. B. Motors $\frac{1}{2}$ to 25 H. P., 5 H. P. \$55.75

DRILLS

20⁸ Lever, Wheel & Lever and Power Feed.
24⁸ and 28⁸ sliding head, back gear, power feed.
Bausch Multiple 16 spindle No. 1 Morse Taper.
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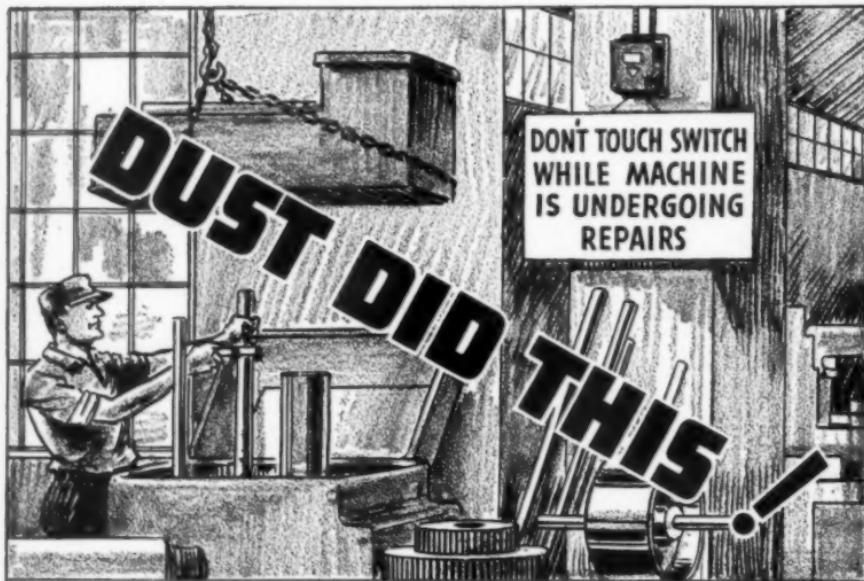


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